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P. 755, 824, 846
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AUGUST 1902

New York State Museum

FREDERICK J. H. MERRILL Director
EPHRAIM PORTER FELT State Entomologist

Bulletin 53

ENTOMOLOGY 14

17th Report of the State Entomologist

ON

INJURIOUS AND OTHER INSECTS

OF THE

STATE OF NEW YORK

1901

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UNIVERSITY OF THE STATE OF NEW YORK

1902

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1902

Price 30 cents

University of the State of New York

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New York State Museum

FREDERICK J. H. MERRILL Director

EPHRAIM PORTER FELT State entomologist

Bulletin 53

17TH REPORT OF THE STATE ENTOMOLOGIST

1901

To the Regents of the University of the State of New York

I have the honor of presenting herewith my report on the injurious and other insects of the state of New York for the year ending Oct. 15, 1901.

General entomologic features. The forest tent-caterpillar, *Clisiocampa disstria* Hübn., as was predicted last year, has, generally speaking, not been nearly so injurious the last season, though in places here and there in the state, it has inflicted considerable damage. Its abundance in orchards adjacent to woods badly infested the previous year was a somewhat characteristic feature of the attack this season. The common apple-tree tent-caterpillar, *Clisiocampa americana* Fabr., has also been abundant in different sections of the state, but it has not been specially injurious as a rule. The white marked tussock moth, *Notolophus leucostigma* Abb. & Sm., has been quite harmful to the shade trees of Buffalo. The destructive work of the elm leaf beetle, *Galerucella luteola* Müll., has been continued in the Hudson river valley, and in its northern part this insect has succeeded in extending its range to a number of villages previously infested with very few or none of these pests. The fall web worm, *Hyphantria cunea* Drury, has been exceedingly abundant in portions of the southern part of the valley and near the western end of Long Island. The depredations of the Hessian fly, *Cecidomyia*

destructor Say, were so general and so severe as to inflict enormous damages, they having been estimated by competent parties as high as \$3,000,000. A very serious matter has been the discovery that the notorious gipsy moth, *Porthetria dispar* Linn., has become well established in the city of Providence R. I. Investigations made during the summer show that the pest already occupies a considerable area in and about that city. While this spread has not been directly toward New York state, it may well be regarded as a warning of what may occur within a few years, and residents of the state are advised to keep a sharp lookout for the advent of this very destructive insect.

Office work. There has been no relaxation in the pressure of office work, and, though there has been an apparent decrease in the amount of correspondence, all of the office staff have been obliged to work overtime in order to meet the demands of the situation. The determination of scale insects for the state department of agriculture still makes considerable inroads on our time. Most of this important and very difficult work has fallen on my first assistant, Miss Boynton. On the request of the commissioner of agriculture, made necessary by the position of the state entomologist of Virginia, who refused to accept any certificate unless it was vouched for by an official entomologist, a general statement was issued approving the work of his inspectors. The time of the office force has been occupied to a considerable extent by the reading of proof and verification incident to the carrying through the press of two very important bulletins soon to be issued, one on the important scale insects of the state and the other on aquatic insects of the Adirondack region. A number of excellent lantern slides have been purchased, and some made from original photographs. These form a nucleus of what will soon become an excellent collection for use in illustrated lectures. The new cards for recording accessions to the entomologic collections have proved very satisfactory, resulting in a great saving of time. 954 letters, 295 postals and 693 packages were sent through the mails during the year.

There has been an unavoidable break in the office caused by the resignation of my first assistant, Mr C. S. Banks, who severed his connection with the office July 15, a particularly unfortunate time, since it is the season when insect activities are at their hight. Miss Margaret F. Boynton was promoted to the position of first assistant, and Mr C. M. Walker, who has been an advanced student in entomology for nearly two years under Prof. C. H. Fernald of the Massachusetts agricultural college and who was the special assistant in the preparation of the collection for exhibition at the Pan-American exposition, was appointed second assistant.

Special investigations. Three lines of work mentioned in my previous report have been prosecuted during the past season.

1 The series of experiments with insecticides for the control of the San José scale have been carried on in the same orchard as last year, and the results obtained in 1900 have been largely confirmed. Fuller details of this work will be found on subsequent pages.

2 The study of forest and shade tree insects has been continued, and many of the observations of previous years have been prepared for publication, and those of this season will be put in a similar condition as soon as possible.

3 The special study of aquatic insects, begun in 1900 has also been continued. It is noticed in the following paragraph.

Entomologic field station. The work commenced at Saranac Inn in 1900 was continued at Ithaca N. Y. in cooperation with the Cornell university authorities. Dr James G. Needham of Lake Forest university, Lake Forest Ill. was in charge of the work, as last year. It was largely supplemental to the studies of the previous season, and Dr Needham's report will therefore include a rather full account of the damsel flies, Odonata-Zygoptera, and of the fish food material collected by him at Saranac Inn. A family of small flies (Chironomidae), very important so far as fish food is concerned, has received special study by Mr O. A. Johannsen, an advanced student at Cornell university, and his account will also be included in this report.

Publications. The principal publications of the entomologist, to the number of 62, are listed under the usual heading. The most important of these is the 16th report. Owing to the delay incident to printing, three very important publications have not appeared during the past year, though they are practically ready to be issued. They are: Museum bulletin 46, *Scale insects of importance and list of the species in New York state*, Museum bulletin 47, *Aquatic insects in the Adirondacks* (Dr Needham's report for 1900), and the special paper treating of insects injurious to elm trees. The last is to appear in the 5th report of the fisheries, game and forest commissioners of New York state. These three publications are admirably illustrated by a series of colored plates.

Extension work. Considerable of the time of the entomologist and his former first assistant, Mr C. S. Banks, was occupied by farmers institutes. They covered a period of 23 working days, during which lectures were delivered at the following 14 places: Preston Hollow, Durham, Hensonville, Lexington, Fleischmanns, Halcottsville, Grand Gorge, Walton, Gilbertsville, South New Berlin, New Berlin, Russia, Newport and Frankfort. An important paper was read by the entomologist before the Massachusetts fruit growers association at a meeting held last March at Worcester Mass., and several addresses have also been given by him before various scientific and horticultural organizations.

Collection of insects. The additions to the state collection of insects have been very great. They may be estimated at approximately 16,000 pinned, labeled specimens, besides a great many in alcohol. A special effort has been made to secure desirable biologic material. My former assistant, Mr Banks, and my present assistant, Miss Boynton, have spent a great deal of time during the past year in going over the collection and classifying the insects more thoroughly. Most of the state collection has now been referred to families, and considerable work has been done on beetles (Coleoptera), the scale insects (Coccidae), and the grasshoppers (Orthoptera). The work on the two latter

orders was done entirely by Miss Boynton. Most of that on the Coleoptera was done by Mr Banks, though Mr Walker has given some time to this order in the past few months. An immense amount of work is still necessary before the collection will be in a thoroughly satisfactory condition.

The office has been very fortunate in retaining the entomologic library and collection of the late Dr J. A. Lintner. These collections are not only of great value in a scientific way but they are almost indispensable aids in conducting the work of the department. It is very gratifying that they should be placed where they will receive the best of care, and surely no place is quite so appropriate as the institution where Dr Lintner did most of his scientific work.

Pan-American collection. The preparation of an exhibit for the Pan-American exposition at Buffalo involved much work on the part of the regular office force in addition to that performed by a special assistant, Mr C. M. Walker, who was engaged for three months. It was felt that, since an exhibit was to be prepared, it should be put in first class shape, and so far as possible this was done. One gold and three silver medals were awarded the exhibit. A brief account of this collection together with a catalogue is appended to this report.

New quarters. The removal of the office from the old quarters in the capitol to Geological and agricultural hall has been a great advantage, since it gave not only much needed space but also essential facilities. The floor space of the general office and the amount of shelving have been much increased by the change, but there is still none too much room. The admirably equipped dark room in the general office supplies a much needed want, as it permits the photographing of insects and their work in a minimum amount of time. The space outside of the general office affords an excellent opportunity for the display of insects and their work in a place readily accessible to the public. Several special collections have already been prepared and placed on exhibition, and it is proposed to give considerable prominence in the display collection to the injurious and bene-

ficial forms. The large one now at the Pan-American exposition will also be placed on exhibition as soon as it is returned.

Voluntary observers. Most of the persons cooperating with the office in 1899 and 1900 in this capacity have continued to render substantial aid this season. Their number has naturally decreased somewhat, and, on account of the pressure of work in early spring, due to the preparation of the exhibit at Buffalo, there was little opportunity to strengthen their ranks. Many valuable observations were made, and summaries of the reports will be found on p. 776-800.

Acknowledgments. The entomologist is under obligations to other workers along the same lines. To Dr L. O. Howard, chief of the division of entomology of the United States department of agriculture, and his staff, special acknowledgments are due for the determination of a great many insects and for promptly placing information at my disposal. Prof. J. H. Comstock of Cornell university deserves special mention for so kindly placing the facilities of his department at the service of the entomologic field station, and for giving the work such hearty support.

It is a pleasure to acknowledge the continued support and encouragement given by the regents during the past year. The work has necessarily been somewhat hampered by the moving into new quarters and by unforeseen changes in the staff, but the outlook for the future is most auspicious.

Respectfully submitted

EPHRAIM PORTER FELT

State entomologist

Office of the state entomologist

Albany 15 Oct. 1901

INJURIOUS INSECTS

Cecidomyia destructor Say

HESSIAN FLY

Ord. *Diptera*; Fam. *Cecidomyiidae*

This species was first observed in this country in New York and its common name was bestowed in the belief that it came to us in packing or straw shipped to the Hessian soldiers then stationed on Long Island. The probabilities tend in that direction though absolute proof may always be wanting. This pest attracted the attention of entomologists in the early part of the last century on account of its serious injuries, as it gradually spread over the country. Dr Asa Fitch, entomologist of the New York state agricultural society was one of the first to give a detailed account of it and much that he published can not be bettered in this later day. His account is now almost inaccessible to the general public and though the pest has been treated in some detail by later writers, particularly by Prof. Webster and Prof. Osborn, there is no complete recent account of it as it occurs in New York. A very good general account of the insect in the United States is given by Prof. Osborn in Bulletin 16, new series, division of entomology, United States department of agriculture.

Early injuries in New York by the Hessian fly. This summary account of the depredations of the pest is taken largely from the quite full treatise on it given by Dr Packard in the 3d report of the United States entomological commission.

The Hessian fly first became a serious pest in 1779 at which time and for several succeeding years wheat was severely injured or wholly destroyed by it in Kings and Richmond counties. In 1786 and 1787, its ravages again attracted considerable attention in this state, the crop of eastern Long Island having been almost universally destroyed. In 1803 very severe losses were caused by its operations in Saratoga and Washington counties and on two or three occasions in earlier years many of the fields in Saratoga county were entirely destroyed. Again in 1844 losses occasioned by it on Long Island and at Rochester

were very severe. Throughout the state of New York it was exceedingly destructive in 1846. In the western section it was estimated to have caused a loss of not less than 500,000 bushels. It was also very injurious in some counties in New York and in Ohio in 1849. It was exceedingly destructive about Syracuse in 1876, whole fields and parts of others turning yellow and showing the ravages of the fly to a greater extent than had ever been witnessed, and in 1877 and 1878 white wheats were severely damaged, the presence of the Hessian fly in Cayuga, Seneca, Tompkins and Yates counties being specifically recorded. There was some injury in Tioga county in 1881 and very slight damage was reported in 1882 from Columbia, Genesee, Herkimer, Monroe, Niagara, Yates and Wyoming counties, it being more serious in the latter. Dr Lintner, in his 5th report, p.263, states that this insect caused more injury than usual in western New York in 1884.

Recent injuries in western New York. The following records were taken largely from reports of voluntary observers.

1899. The Hessian fly has done much damage in the wheat fields in and about East Amherst, Erie co. In my own fields one fifth of the wheat is down. This was sown on Sep. 9, 1899. Some fields that were sown in August are from one half to nine tenths down. All wheat fields in this vicinity are damaged more or less. Even those that were sown the latter part of September or in early October are infested to some extent. (John U. Metz)

The Hessian fly is doing considerable damage in and about Belle Isle, Onondaga co. (Mrs. A. M. Armstrong)

The Hessian fly has seriously injured early sown wheat all through Seneca county. Some pieces are very seriously damaged while others are comparatively free from the pest. It is estimated that about one fourth of the crop has been lost through the attacks of this insect. (J. F. Hunt, Kendaia)

I noticed very bad work indeed in this section from the Hessian fly. A great amount of wheat is down. Perhaps one third of the straw is lodged and the damage will be one fourth of the entire yield. (C. H. Stuart, Newark, Wayne co.)

1900. The Hessian fly is in the vicinity of East Amherst in great numbers and the white wheat throughout this section is nearly all down flat. One field of 8 acres in this vicinity is almost totally destroyed. It was sown August 27. (John U. Metz, Erie co.)

The wheat in the vicinity of Warner, Onondaga co. was damaged more than last season. Fully one third of it lodged and the injury is more general than last year. I have found the flies in late sown wheat. One piece sown September 10 was very thoroughly infested, not a single plant being free from the pest. (Mrs A. M. A. Jackson)

The Hessian fly has done a great deal of damage to some pieces in this section of the country. (J. F. Hunt, Kendaia, Seneca co.)

The Hessian fly has been very bad in some wheat, some pieces being so very severely injured that they have not been harvested. (C. E. Chapman, Peruville, Tompkins co.)

The Hessian fly has been working very badly indeed in early sown wheat. The later sowings are not nearly so badly infested. Perhaps one fourth of the entire crop has been destroyed. (C. H. Stuart, Newark, Wayne co.)

1901. Damage from Hessian fly work is very evident in several pieces of wheat examined. Probably 10% of the stalks have lodged as a result of the work of this fly. (M. H. Beckwith, Elmira, Chemung co.)

Mr M. F. Adams of Buffalo, after making an examination of a number of fields in the vicinity of that city finds that the damage as a rule runs from 6% to 8%. Very little wheat, however, is grown in the immediate vicinity of Buffalo and it is not surprising that the few fields sown should escape serious injury.

The Hessian fly is present in overwhelming abundance. Many fields of white wheat are not worth cutting. There seems to be no difference between the early and late sown wheat. One field was sown September 15, another September 21 and another September 29 and yet 90% of each one of these fields is on the ground. Red Russian and red Mediterranean wheats seem to

be exempt thus far from attack. (J. U. Metz, East Amherst, Erie co.)

J. F. Rose of South Byron reports as follows: A large acreage of what early promised to be good wheat will not be worth cutting as a result of Hessian fly attack. A few farmers are plowing up their wheat but as the wet weather has been favorable for a good catch of clover, many will not plow it up as they are anxious to save the seeding. Very little or no white wheat will be harvested in this vicinity. Some farmers I saw yesterday had not been in their wheat fields for a few days and the grain had gone to the bad very rapidly since they saw it. I visited and examined wheat fields in three towns today and I have heard some bad reports from other neighboring towns. Several fields of red wheat have been examined and they are not badly infested as yet. 90%, however, of the wheat in this section is white, a variety known as no. 6. It has been exclusively grown for some years, as the quality is good and it is a fine yielder. The red wheat is known as no. 8. As regards proximity of other fields, there is so much grown that all fields are comparatively close. Probably there is no field that is a half mile from another and most of them are much nearer or within a quarter mile of one another. The prospect early was very good for yields of 20 to 35 bushels an acre in all fields, as there was little winter injury. A field near here belonging to G. G. Chick was not sown till the first week in October and it looked well much later in May than early sown fields, but today Mr Chick tells me that there will be no wheat. This wheat is no. 6. One farmer reports that the fly can now be found in barley. Regarding the farmers from whom I have reports, it is quite certain that some of them have estimated their yield of wheat too high. The few stalks standing are about as thick as hoop poles and when pulled up it is found that they are infested with the fly to some extent. The damage will hardly exceed 5% in the fields of red wheat. The following are reports from fields of wheat in this vicinity:

William Caswell of South Byron sowed 10 acres of white wheat September 3 and today he thought that he might get 10% of the crop. 10 acres of white wheat were sown by him on the 16th and the grain is no better than in the preceding field. 10 acres of red wheat were sown by him September 13 and this variety was not damaged to exceed 5%.

Clifford Davey of Leroy township sowed 12 acres of white wheat between September 12 and 15 and now he is plowing the ground up for beans. 12 acres of the same variety were sown by him between September 18 and 20 and this field has not been so very badly injured. Probably about one fourth of the grain is down.

Frank C. Walker of Stafford township has 40 acres of white wheat which he began sowing September 12 and finished on the 20th. Mr Walker does not expect to more than get his seed back. The grain sown first is a little worse than later plantings but there is not much difference. The first of May there was an excellent prospect of getting 25 bushels an acre. The last crop on these fields ranged from 25 to 40 bushels an acre.

Lucien Campbell of Stafford township sowed 12 acres of white wheat between September 7 and 9. Today he estimates that 15% of the grain is still standing.

James Berlin of Stafford township sowed 32 acres of white wheat September 15, the grain following barley and oats. He now estimates that he may get 5 bushels an acre. 7 acres were sown by him October 1. This was on ground used for growing corn the previous year and it is 60 rods from any other wheat. This field is no better than those sown early in the season though two weeks ago it looked as though it might produce 30 bushels an acre.

Henry Bucklin of Stafford township sowed 11 acres of red wheat between September 15 and 20 and it appears to be but little damaged up to date.

John Walsikoski of South Byron has 24 acres of white wheat sown between September 10 and 12 but he will not get his seed back.

William Scoins of Stafford township has 4 acres of white wheat sown September 7 or 8 and he will not get his seed back. 16 acres sown September 20 is no better than his earlier sown pieces, though it did not show injury as early in the spring.

Charles Buckland of South Byron has 15 acres of red wheat sown September 5 and 75% to 80% of it is apparently all right.

George Kelly of South Byron has 8 acres of red wheat sown September 1 and 80% of it is free from injury. Another field of 42 acres of red wheat sown between September 3 and 8 looks well and bids fair to yield 25 to 30 bushels an acre.

William Cork of South Byron sowed 8 acres of red wheat September 9 and 75% of it is all right. In sowing this field, the drill skipped two strips across the field and when the wheat came up the omission was seen and white wheat was sown in its place. The Hessian flies have destroyed all of this white wheat.

John Berlin of Elba township sowed 54 acres of red wheat between September 10 and 13 and he estimates that his crop will average more than 20 bushels an acre. There is very little evidence of insect injury.

The Hessian fly is also in rye, timothy and barley in this vicinity. A perfectly reliable farmer tells me that he has found as many as 50 larvae of the fly in one stalk of barley. One of our large farmers in South Byron is now cutting his barley and curing it for hay, it is so badly infested with Hessian fly. I went yesterday to see some wheat in Leroy township that is locally known as golden chaff or Clauson's golden chaff. This is a white wheat and has been but little troubled with the Hessian fly. It is no more injured than the red wheat, known as no. 8. Many farmers will sow this kind and the red wheat but if none of the flies' favorite no. 6 be sown, Mr Rose is inclined to think that these more or less resistant varieties will suffer another year.

R. L. Darrison of Lockport, Niagara co. investigated the injuries by Hessian fly in his vicinity and the reports received by him do not vary very much from those made by other parties.

The fields of white wheat, even those sown quite late in the season suffered severely while those of red wheat, whether sown early or late, escaped with comparatively little injury. White wheat as a rule suffered anywhere from 30% to 80% or more loss while rarely more than 20% of the red wheat was injured. This report covers fields representing over 200 acres. He also states that severe injuries were reported to him from Orleans and Seneca counties.

Mrs A. M. Armstrong, Belle Isle, Onondaga co. states that the Hessian fly has been quite abundant in that section. She writes: "My father, who has had an opportunity to watch a number of fields in a general way is of the opinion that late sowing is not a preventive measure and as late sown wheat does not do as well as that sown earlier, he has for years followed the practice of sowing his about September 10. He has now 25 acres sown September 25 in which the fly worked last fall, causing it to stool considerably but not many of the plants were killed while in fields of late sown grain many of the infested plants died. Specially was this true in fields where commercial fertilizers were not used in the drills. My father saw one field where the farmer was careless and let his fertilizer box become empty half way across the field. No phosphate was applied on the last trip across the field or on the headlands and in these places the fly worked very badly indeed. In some unfertilized rows there were places of a foot or more where the wheat was entirely killed. Mediterranean wheat appears to be relatively free from the pest."

Virgil Bogue of Albion, Orleans co. reports that wheat is in bad shape from the Hessian fly.

Miss Harriet M. Smith of North Hector, Schuyler co. reports comparatively little injury in her immediate vicinity, though some damage is said to have occurred at Trumansburg, Tomkins co.

J. F. Hunt, Kendaia, Seneca co. states that some pieces of wheat have been one third destroyed by Hessian fly while in others there is very little injury. He fails to find much evi-

dence in favor of the late sowing of wheat. The only pieces that were exempt were some of those sown so late that it would not be advisable to follow such an example. One field of 30 acres sown the last week in October was free from the fly. The barley crop was completely destroyed in Seneca county.

C. E. Chapman of Peruville, Tompkins co. reports that the Hessian fly is in nearly every stalk. Many fields have been nearly ruined and there will not be half a crop. The most of the sowings were made between August 25 and September 20.

C. H. Stuart, Newark, reports that in a seed bed where they have several varieties of wheat all were badly infested with the fly except one row of Dawson's golden chaff, not one straw of which is down. It is most remarkable as the rest is very bad. This check row was sowed by hand, the rest by machine, and was put in 1 inch deeper. All were sown at the same time.

W. H. Roper, Wyoming, Wyoming co. reports on a number of fields to the effect that from one fourth to one half of the wheat had become lodged by June 10 and on June 19 he reports that many fields in that vicinity will not be harvested on account of the poor crop. 4 acres of Genesee giant sown by him September 19 was not infested with the fly. It has a very coarse straw and stands up in good shape. His no. 6, sown the next day, was about half ruined as nearly as could be estimated.

The above records show very plainly indeed that the destructive work of the Hessian fly has been increasing and gradually extending during the last three years. For example, in 1899 injuries were reported only from the counties of Onondaga, Seneca and Wayne; in 1900 accounts of injuries were received in addition from Erie and Tompkins counties; and in 1901 serious complaints came from Chemung, Erie, Genesee, Niagara, Onondaga, Orleans, Schuyler, Seneca, Tompkins, Wayne and Wyoming counties. In each case the reports were accompanied by the statement that the injuries had been much greater than in preceding years. In Genesee county in particular, through the energetic action of J. F. Rose, exceptionally full data was

received and there is little reason for believing, after making allowance for the relative amounts of wheat grown in the various counties, that the conditions reported in this county were essentially different from those in some of the others. It has been estimated by good authorities that half the normal crop of New York was destroyed by the Hessian fly in 1901, entailing a loss of about \$3,000,000.

An investigation in the fall of 1901 showed that in regions where the Hessian fly had been injurious, mostly red wheat (largely no. 8 in some sections, at least) had been sown and that very little or no Hessian fly could be found in such pieces. A few of the pests were found in volunteer white wheat (no. 6) but no field of this was examined as none were in the vicinity of the places visited.

Description of various stages. The adult fly is rarely observed by wheat growers. It is a small, nearly black, dark winged

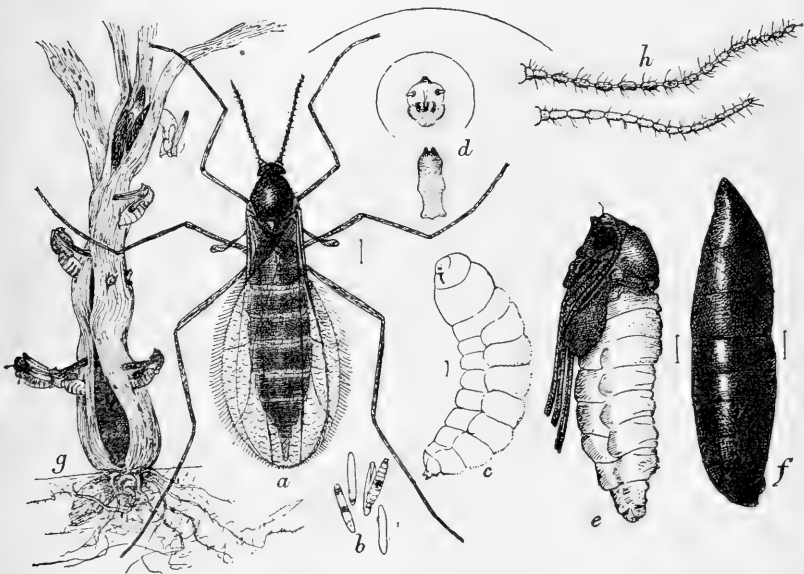


Fig. 1 Hessian fly: *a* female; *b* flaxseeds or puparia; *c* larva or maggot; *d* head and breast bone of same; *e* pupa removed from puparium; *f* puparium or flaxseed; *g* infested wheat stem; *h* male and female antennae; *b* and *g* about twice natural size, all others much more enlarged (after Marlett, U. S. dep't agric. Farm bul. 132)

midge about $\frac{3}{32}$ inch in length and possesses very long, slender legs. There are a number of closely related flies which have a similar appearance but ordinarily if one about this size and having the general appearance represented in fig. 1*a* is found on

young plants in wheat fields, it is very likely to be this notorious nest.

The puparium or "flaxseed" stage is so well known that a description is hardly necessary. The "flaxseeds" are about $\frac{1}{8}$ inch long, of light brown color and occur near the base of the plants. One very much enlarged is represented at *f* in fig. 1.

The slender, delicate, greenish white maggots are also somewhat familiar to the wheat grower and a detailed description of them in this connection is hardly necessary. The full grown larva is about $\frac{1}{8}$ inch long and it is usually found in the field between the sheath and the stem of the young plants.

The eggs have been sufficiently characterized in a following paragraph treating of their deposition.

Food plants. The food plants of the Hessian fly are of considerable importance because if it is able to subsist on a number of grasses and grains its control is manifestly much more difficult. The Hessian fly was early recognized as a pest of wheat, rye and barley, and despite the fact that records are occasionally met with of its occurrence in timothy and other grasses and grains, the weight of evidence seems to indicate that it does not live to any extent at least on anything but the above crops. It is possible that at exceedingly rare intervals, comparatively speaking, a few may mature on timothy, but in some instances at least related species have been confounded with it.

Life history. Normally there are two generations in this latitude though there may be several supplementary ones. The adult fly may deposit from 100 to 150 eggs, according to Marchal, placing them between the ridges on the upper surface of the blades of young wheat. Individuals of the spring brood occasionally thrust their eggs beneath the sheaths of the lower leaves. The process of oviposition has been carefully described by Mr Herrick as follows:

While depositing her eggs the insect stands with her head toward the point or extremity of the leaf, and at various distances between the point where the leaf joins and surrounds the stalk. The number found on a single leaf varies from a single egg up to 30 or even more. The egg is about $\frac{1}{10}$ inch long, cylindrical, rounded at the ends, glossy and translucent, of a pale red color,

becoming in a few hours irregularly spotted with deeper red. Between its exclusion and its hatching these red spots are continually changing in number, size and position and sometimes nearly all disappear. A little while before hatching two lateral rows of opaque white spots, about 10 in number, can be seen in each egg.

The flies may occur any time after the wheat is up and before killing frosts, and possibly, as pointed out by Dr S. A. Forbes, *between* killing frosts. The eggs hatch in about four days and the maggots or larvae then make their way down the leaf to the base of the sheath. These soft maggots do not burrow, but lie between the sheath and the stem and absorb their nourishment from the adjacent soft tissues, which gradually become depressed and give way as the little insect develops. The maggots are usually found in the fall close to the roots of winter wheat and at or beneath the surface of the soil, while the spring larvae are more common about the second or third joint of the plants. The larval transformations occupy about 20 days but their duration is considerably affected by weather conditions. The duration of the pupal stage is very variable and is much affected by climatic conditions. Cold or heat and dryness tend to lengthen and heat and moisture to shorten the duration of the different stages, specially the pupal. The winter is passed by this insect in the "flaxseed" or pupal stage. The spring brood of flies emerge in April or May and in turn lay eggs on the more luxuriant leaves and another life cycle may be completed in about 30 days.

Number of generations. The short time necessary to complete the life cycle permits a number of broods in one season and apparently there are as many generations as weather and food conditions will permit, and we may expect constant breeding of this insect during the growing season if continued damp weather enables wheat, barley and rye to grow luxuriantly throughout that period. During midsummer as a rule the fly, if it appears at all, will find only a little volunteer wheat in fit condition for it to live on, but this was very different with barley in 1901. The spring brood had passed through its transformations and the continued moist weather brought out the flies in hosts. Eggs were laid in large numbers in the barley, specially in that which

was sown late, and in early July many fields in Genesee county were badly infested. The pests were near the ground in the latest sown barley and in that early sown, they occurred from 10 to 12 inches from the ground, showing at least, that the insect breeds by preference in the soft growth and inferentially that it thrives only indifferently in the older, harder growth. This relation between the rank succulent growth of the grain and injury by the Hessian fly was further shown on one hilly patch of wheat. There was considerable grain on the gravelly, comparatively dry knolls while in the more moist, probably poorly drained gullies the stalks of wheat were very scattered. Here seems to be a possible reason why a variety of wheat may be comparatively "fly proof" in one section and not in another, since its apparent resistance may depend very largely on the relative hardness or maturity of the stalk at the time the flies appear and deposit eggs and this might easily vary in widely separated sections during the same season. Another generation might easily have developed, so far as time is concerned, between the middle or the latter part of July, at which date the above mentioned brood attained its maturity, and the period when the normal fall brood appears, which is usually before September 20 in New York. The above shows that four generations and possibly more may develop in a season, but it should be distinctly understood that, as a rule, only two full broods are developed, and that the intermediate summer generations are usually very limited and that their development is very dependent on weather and crop conditions.

Emergence and flight. This is an exceedingly important matter, because on its correct understanding rests one of the most successful methods of preventing injury by this pest. This, like the development of the summer generations, is dependent on weather conditions. The following rules will aid in understanding the situation:

- 1 The flies may remain an indefinite period in the "flaxseed" or pupal stage during dry weather.

- 2 "Flaxseeds" or pupae are very likely to develop flies in large numbers during a period of damp, warm weather.

3 Adults are killed by heavy frosts but this is not true of larvae and "flaxseeds" or pupae and hence flies may appear and deposit eggs *between* killing frosts.

4 Under certain conditions some of these insects may spend nearly a year in the "flaxseed" stage.

The above rules show that egg-depositing flies may appear at any time during the growing season, providing weather conditions are favorable, though naturally we would expect them to appear in great numbers only at the first favorable period after a large brood had attained the "flaxseed" or pupal stage. Thus, as our springs are usually warm and moist, this means that ordinarily most of the "flaxseeds" will develop flies in the latter part of April or early May. Then there must be a sufficient period for the completion of a life cycle before another brood of flies can appear and if at that time and for a considerable period thereafter the weather be dry and hot, comparatively few or no flies will appear till conditions change and consequently we can not tell just when flies will appear again.

We do know, however, that early sown winter wheat is very apt to become badly infested in the fall while late sown wheat frequently escapes. In the first instance the young wheat is up and receives a deposition of eggs before or *between* killing frosts, while in the other case it escapes. Weather conditions must always be considered in sowing winter wheat. The general rule for the safe sowing of winter wheat may be stated as follows:

Moist warm weather in early fall will permit the safe sowing of wheat at a relatively early date, but when the early fall is dry, delay sowing till the latest possible date. The normal or average date when wheat can be sown in New York without danger of its becoming infested with the Hessian fly is about September 20.

Effects of continued dryness and moisture. Following is an interesting record by Dr Riley:

It has long been known that the Hessian fly flourishes best when the chinch bug flourishes least; in other words, that wet weather favors it. The prejudicial effect of drouth has not been hitherto observed, that we are aware of, but it was very noticeable in parts of Ohio, where the puparia literally dried up. Our attention was first called to the general death of the

insect in the "flaxseed" state by E. W. Claypole of Yellow Springs O. and our observations subsequently confirmed his experience. The intense heat had not only dessicated the *Cecidomyia* but what is still more remarkable, in most cases the parasites also.

On the other hand wet weather favors their development and under the influence of frequent showers the flies have been known to issue in large numbers from their "flaxseed" cases in early summer. This was very nicely illustrated last July in case of the barley attack. The continued rains in the spring induced the flies to complete their transformations early and July 10 a number of places were seen where the spring brood of the fly had completed its transformations and departed. This was further confirmed by finding several large fields of barley sown about May 15, badly infested with larvae and young puparia of this insect. The barley attack was confined largely to the upper, softer nodes and in at least one large field the infestation was very thorough. Every stalk was infested with a few of the pests and eight plants taken at random from this field contained from 19 to 54 individuals, most of them being in the larval stage. This serious infestation is very interesting when compared with the following record of the weather in two localities in that section of the state. The table given below is compiled from the records of the New York state weather bureau and shows the total precipitation in each of the growing months and the number of rainy days.

TABLE OF PRECIPITATION

Alden, Erie co.			
Year	Month	Total precip. in in.	No. rainy days
1900	Aug.	2.48	7
	Sep.	3.26	7
	Oct.	3.18	7
	Nov.	8.42	16
	1901	Mar.	3.09
	Ap.	4.34	11
	May	4.49	18
	June	1.49	7
Elba, Genesee co.			
1900	Aug.	2.39	11
	Sep.	2.69	7
	Oct.	3.59	8
	Nov.	3.99	21
1901	Mar.		
	Ap.	4.25	10
	May	5.13	19
	June	3.38	10

It will be seen from the above table that last May was very wet, rain falling 18 and 19 days respectively in the two localities. It is no wonder that the spring generation of the fly completed its transformations and that the adults were ready to oviposit and infest the late sown barley.

Signs of infestation. The first indication of attack is found in the darker color of the leaves and a tendency among the young plants to stool freely. The broader lower leaves and the absence of a central shoot, it having been killed, are also noticeable in infested fields. As the attack advances the infested plants turn yellow or brown and die and the maggots may be found at the base of the leaves near the ground. The spring brood attacks tillers or laterals which were unharmed in the autumn, dwarfing and weakening the stems so that the grain usually lodges before ripening and can not be harvested well.

Rule for determining time for sowing winter wheat. This has been the subject of considerable study by Prof. Webster of Ohio and Dr Hopkins of West Virginia. The latter, in Bulletin 67 of the West Virginia agricultural experiment station, has given in considerable detail much data bearing on this subject and in that bulletin he elaborates a very interesting rule for determining this date in various sections of the country. His results are not only based on considerable scientific research, but they have been confirmed by practical experience. Dr Hopkins finds: 1) That under similar conditions of land surface, other than altitude, there is a normal rate of difference of time in the periodical phenomena of plants and animals for all differences in latitude and altitude. 2) That under normal conditions the rate of average variation for the beginning or ending of any phenomenon is not far from one day for every fourth of a degree of latitude, or for every 100 ft of elevation. Using this rule and taking as a base the time, September 25, determined by Prof. Webster through observation as the date when the Hessian fly normally disappears from fields about Columbus O. in latitude 40° and with an altitude of 800 ft, it will be found that in Genesee county, latitude 43° , the normal period when wheat can be sown without injury by the Hessian fly is September 21. This calculation is for sea level and the date may be pushed forward

approximately one day for each 100 feet of elevation. The method of reaching this conclusion is as follows: the 3° difference in latitude between the two places gives an allowance of 12 days, that is four for each degree of latitude, and as Genesee county is farther north, the 12 days may be subtracted from the date given for Columbus, but before subtracting this, the date for Columbus must be brought down to a sea level calculation, and as that date is September 25 at 800 feet above sea level, the safe date must be eight days later, or approximately one day later for each 100 feet less in elevation. This brings the safe date at Columbus O., were it at sea level, at October 3, and bringing this date forward 12 days, the allowance made for the 3° difference in latitude, we have the normal date for Genesee county in localities at sea level. This date, September 21, may then be advanced one day for each 100 ft elevation above sea level.

At first sight this rule may appear a little cumbersome, but it is really a very simple one and it certainly deserves a trial by every farmer troubled with the Hessian fly. If it accomplishes nothing more, it gives a basis on which to begin experiments, and we are therefore able to approximately figure the safe date for any locality and then this should be checked up by past experiences or put to the test of future use. The farther north the location and the higher the elevation, the earlier may the wheat be sown with safety.

Parasites. The parasites of the Hessian fly are very important, since were it not for them it is extremely probable that it would be much more destructive than it is. The easiest way to determine the proportionate number of parasites in any one field is to take infested stalks and breed the adult insects from them. A net-covered jelly tumbler or fruit jar, taking care to avoid close covers and resulting molds, will answer very well as a breeding cage. Later in the season, after the parasites have emerged under natural conditions, an examination of "flaxseeds" in the field will give some idea of the relative number which have been killed by these tiny friends of man, since each having a cir-

cular hole in the side has produced a parasite and not a fly. Sometimes fully nine tenths of the Hessian flies are destroyed by parasites and occasionally entomologists have experienced difficulty in breeding any adult flies from infested wheat stems because the parasites were so numerous.

The above notes give some idea of the importance of these little creatures. One

of the most efficient of these parasites is known as *Merisus destructor* Say, a minute four winged fly which is represented in the accompanying illustration. It occurs not only

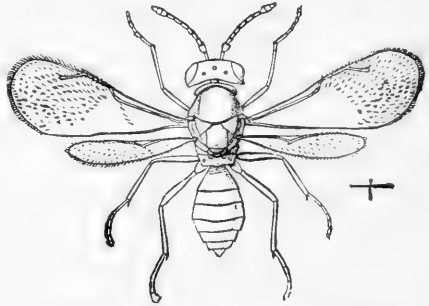


Fig. 2 *Merisus destructor* (after Riley)

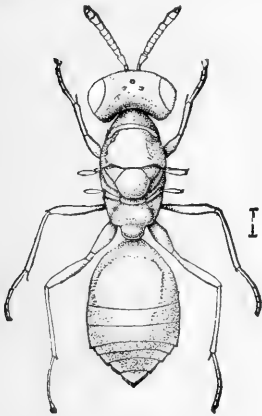


Fig. 3 *Boeotomus subapterus* (after Riley)

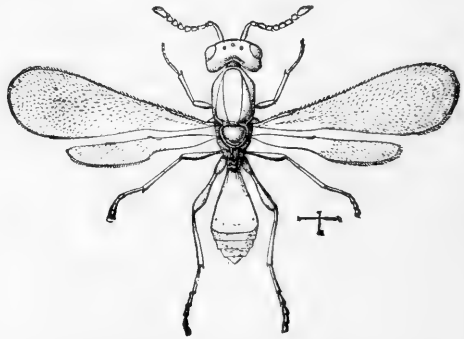


Fig. 4 *Platygaster herrickii* Pack. (after Riley)

throughout the American territory affected by the Hessian fly but it is known in England and Europe.

Another parasite which ranks next in economic importance to the preceding is known as *Boeotomus subapterus*. It is frequently wingless as seen in fig. 3. The proportion of winged to wingless individuals is said to vary at different seasons of the year. In Missouri this species has been bred from infested wheat stalks more commonly than the preceding.

Platygaster herrickii Pack., represented in the accompanying figure, is another common parasite of this grain pest.

This little parasite has been credited with puncturing the Hessian fly eggs and laying its own therein to hatch later and consume the larva. This was considered a very improbable method of attack, as most true egg parasites complete their life cycle within the egg itself though the observations of Marchal on *Trichasis* have shown the probability of such a mode in this species.

Entedon epigonus Walker. This species was introduced into this country in 1891 through the efforts of Dr C. V. Riley who received parasitized pupae from Fred Enoch of England. These were distributed to Prof. Forbes of Illinois, Prof. Cook, then of Michigan, and Prof. Webster, then of Indiana. It is impossible to state even at this date how much benefit may ultimately result from the introduction of this para-

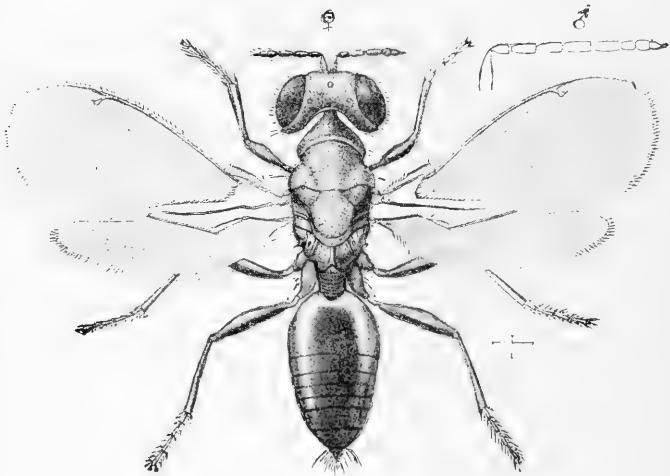


Fig. 5 *Entedon epigonus* Walk. (after Howard, *Insect life*, 7:356, 1895)

site, but Mr Marlatt, writing of the Hessian fly in 1901, states that considerable good may be expected from it. It had become established in the vicinity of Washington D. C. and presumably in Illinois, but whether it will continue to hold its own and prove an efficient aid in the control of this serious pest remains to be seen.

Two other primary parasites of the Hessian fly are known in America. They are *Pteromalus pallipes* Forbes and *Eupelmus allynii* French.

Preventive and remedial measures. *Late sowing.* One of the most important preventive measures is to delay sowing till after the adult flies have deposited their quota of eggs and perished. In New York this means delaying sowing as a rule till September 20 or a little later. A preceding paragraph gives more specific directions for the determination of the date when wheat may be safely sown in different latitudes and at varying altitudes. The difference in latitude in New York is relatively slight but altitude has considerable influence on the period when wheat may be sown with safety. The experiences of 1900 and 1901 have demonstrated anew the destructive powers of this pest and as many of the holdings in western New York are exceedingly small and the fields of wheat so near one another that it is very easy for the flies to make their way from one to the other, the delaying in the date of sowing is of itself not sufficient to guaranty immunity from the ravages of this insect.

Resistant varieties. There is probably no such thing as absolutely fly proof wheat but experience has shown that the varieties known as no. 8, Dawson's golden chaff, White chaff, Mediterranean, red Russian, prosperity and democrat have withstood the attack of the Hessian fly very successfully in western New York, even when the beardless, weak-stemmed white wheat known as no. 6 was very seriously injured and sometimes totally destroyed. Some of the varieties badly affected by the fly are better yielders than the above but the only safe way is to sow one which is able to resist attack to a considerable extent. It is very remarkable that while Dawson's golden chaff was so free from injury in the Empire state, it sustained much harm last spring in Canada, its native home.

Good culture. Thorough culture counts for very much when trying to grow a good crop of wheat. The field should be thoroughly prepared and the land gotten into excellent condition before it is considered fit for the crop. An endeavor should be made to get a growth of firm straw and to produce plants vigorous enough so that if attacked they will tiller

abundantly and thus avoid a serious decrease in yield. A badly drained soil, where conditions favor a moist growth of succulent straw, appears to be quite favorable to the fly and in some such places the injury was much more manifest than on higher well drained land. Prof. Webster of Ohio, who has studied this insect for over 15 years, believes that four fifths of Hessian fly injury can be prevented by a better system of agriculture.

Trap strips. This device has long been recommended by entomologists and was earnestly advocated by Dr Fitch but there has been considerable difficulty in getting farmers to take up the idea and go to the trouble of preparing a little ground, sowing it early and then turning it under soon after the flies have deposited their eggs. Many wheat growers prefer to wait and take their chances on the crop not being seriously injured by the fly. S. W. Wadhams of Garland N. Y. made a test of this plan with most excellent results. Aug. 25, 1900 he sowed two widths of the drill round a 20 acre field and then sowed the remainder on September 27 and 28 and just before the last sowing came through the ground, his decoy strip was plowed under, put in condition and resown. At the time of plowing he found that practically every leaf and stalk of the wheat was completely covered with the eggs of the fly, so that the strip turned brown and myriads of the flies swarmed up in front and over the horses as they walked over it. The result was that in 1901 he harvested $21\frac{1}{2}$ bushels of no. 6 wheat an acre. This yield was secured when other fields of no. 6 wheat were so badly injured as to produce from three fourths of a crop to almost nothing. Mr Wadhams sowed another trap strip Aug. 20, 1901 and on September 14 he found that the young wheat plants were being rapidly covered with eggs of the Hessian fly, and he now suggests that the trap or decoy strips be plowed under about nightfall or in the cool of early evening, at a time when the few remaining flies, if any be alive, would naturally be resting on the wheat plants, and the chance of covering them deeply would therefore be immensely increased. Agricultural practice in western New York does not always admit of the

trap strip round the sides of a field to be sown with wheat and fortunately this is not necessary because, from what we know of the habits of the flies, it is very likely that they would be attracted to a patch of wheat sown some little distance, a half mile or more from the field which it was proposed to put into wheat. It would be better undoubtedly to have a trap strip beside the field, but if that is impossible, much may be gained by sowing a small patch of wheat at some little distance and turning it under as proposed above.

Burning stubble and chaff. This has been recommended by a number of writers but in western New York at least the common practice of sowing to grass with wheat, prohibits the burning of the stubble. This objection would not hold in regard to burning the chaff from the threshing machines and this might well be done in case the wheat is at all infested by the Hessian fly.

Plowing under stubble. This is also impractical in cases where grass follows wheat but in other instances it would certainly do no harm if the stubble is at all infested, and it is advised where no additional labor or expense be entailed.

Rotation of crops. The judicious rotation of crops will undoubtedly do considerable toward reducing the ravages of this insect, particularly if care is taken to have the wheat fields of successive years at some distance from each other.

Destruction of volunteer wheat. The Hessian fly breeds in volunteer wheat, and wherever possible without incurring undue labor and expense such wheat should be destroyed or plowed under before it can produce the adult flies.

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fused with the Hessian fly); Remarks on the Hessian fly, p. 107-8 (discussion of evidence relating to introduction of this pest); Hessian fly, p. 131-33 (brief general notice).

1889 **Forbes, S. A.** Ill. state ent. 15th rep't, p. 21-34 (observations on life history).

1889 **Lintner, J. A.** N. Y. state ent. 5th rep't, p. 263-64 (injury in 1884 more than usual).

1889 **Riley, C. V. & Howard, L. O.** Burning stubble for Hessian fly. Insect life, 1:294 (discussion of value of this measure).

1890 **Forbes, S. A.** Ill. agric. exp. sta. Bul. 12, p. 377-79 (brief general notice); Ill. state board of agric. June crop report (brief notice).

1890 **Koebele, Albert.** Hessian fly in California. Insect life, 2:252. (record of its occurrence); Hessian fly. U. S. dep't agric. div. ent. Bul. 22, p. 93 (injuries in California).

1890 **Summers, H. E.** Hessian fly. Tenn. agric. exp. sta. Spec. bul. E, p. 6-8 (brief general notice).

1891 **Forbes, S. A.** Ill. state ent. 17th rep't, p. 54-63 (notes on life history).

1891 **McCarthy, Gerald.** N. C. exp. sta. Bul. 78, p. 20 (brief notice).

1891 **Marten, John.** New notes on the life history of the Hessian fly. Insect life, 3:265-66 (observations on development).

1891 **Riley, C. V.** Appearance of wheat infested with Hessian fly. Insect life, 3:339-40 (remarks on the characteristic appearance of infested wheat).

1891 **Riley, C. V. & Howard, L. O.** Hessian fly attacking grasses in California. Insect life, 3:306-7 (records occurrence of two species of *Cecidomyia* in grasses which subsequently proved not to be Hessian fly).

1891 **Webster, F. M.** O. agric. exp. sta. Bul. v. 4, no. 7, p. 133-58 (general account).

1891 **Woodworth, C. W.** Cal. agric. exp. sta. Rep't. 1890. p. 312-18 (variation in Hessian fly injury).

1892 **Garman, Harrison.** Ky. agric. exp. sta. Bul. 40, p. 3-7 (brief general notice).

1892 **Riley, C. V. & Howard, L. O.** Hessian fly in New Zealand. Insect life, 4:405-6 (record of occurrence).

1893 **Webster, F. M.** Insect foes of American cereal grains with measures for their prevention or their destruction. Insect life, 6:146-50 (notes on prevalence and destructiveness of Hessian fly).

1895 **Howard, L. O.** Imported parasite of the Hessian fly. Insect life, 7:356-57 (note on introduction of *Entedon epigonus*); Apparent success of the Hessian fly parasite importations, p. 414-15 (successful establishment of *Entedon*).

1895 **Lugger, Otto.** Minn. agric. exp. sta. 1st rep't ent. p. 117-19 (brief notice).

1895 **Smith, J. B.** N. J. agric. exp. sta. Rep't ent. p. 365, 520-26 (record of injuries in New Jersey and remedial measures); N. J. agric. exp. sta. Bul. 110, p. 1-8 (brief general notice).

1896 **Lugger, Otto.** Minn. agric. exp. sta. 2d rep't ent. p. 11-14 (record of injuries, parasites).

1896 **McCarthy, Gerald.** N. C. exp. sta. Bul. 128, p. 154-55 (brief notice).

1896 **Osborn, Herbert.** Ia. agric. exp. sta. Bul. 33, p. 598-600 (brief general account); Notes on entomological events of 1896 in Iowa. U. S. dep't agric. div. ent. Bul. 6, new series, p. 79-80 (notice of injury, parasites).

1896 **Smith, J. B.** N. J. agric. exp. sta. Rep't, p. 434-35 (injuries in New Jersey).

1897 **Fletcher, James.** Experimental farms (Canada). Rep't, p. 226-27 (notes on injuries).

1897 **Marchal, Paul.** Les Cecidomyies des céréales et leurs parasites. Société entomologique de France. Annales. 66:1-42, 43-47, 51-62, 80-100 (detailed account with original observations on life history, transformations and parasites).

1897 **Webster, F. M.** O. state bd agric. 51st rep't, p. 493-95 (remedial measures for Hessian fly).

1898 **Felt, E. P.** Hessian fly in Pennsylvania. Country gentleman, July 14, 63:546-47 (general account); Hessian fly, Nov. 17, p. 906 (preventive measures recommended).

1898 **Fernald, H. T.** Hessian fly in wheat. Pa. dep't agric. Folder, p. 1-4 (brief general notice).

1898 **Howard, L. O.** Science, new series, 7:246-48 (review of Marchal's paper).

1898 **Johnson, W. G.** U. S. dep't agric. div. ent. Bul. 17, new series, p. 94 (injuries in Maryland).

1898 **Osborn, Herbert.** Hessian fly in the United States. U. S. dep't agric. div. ent. Bul. 16, new series, p. 1-57 (detailed account).

1899 **Felt, E. P.** Hessian fly. Country gentleman, Aug. 10, 64:628-29 (general account); Hessian fly, Nov. 22, p. 942 (rule for ascertaining date for sowing).

1899 **Fernald, H. T.** Pa. dep't agric. Bul. 46, p. 5-8 (brief general notice).

1899 **Fletcher, James.** Experimental farms (Canada). Rep't, p. 173-75 (injuries and remedies).

1899 **Lugger, Otto.** Minn. agric. exp. sta. Bul. 64, p. 551-57 (brief general account).

1899 **Pettit, R. H.** Insects of the year. Mich. agric. exp. sta. Bul. 175, p. 358-61 (brief general account).

1899 **Webster, F. M.** O. agric. exp. sta. Bul. 107, p. 257-88 (detailed account).

1900 **Hopkins, A. D.** W. Va. agric. exp. sta. Bul. 67, p. 239-50 (general account with rule for determining time of sowing).

1900 **Webster, F. M.** O. agric. exp. sta. Bul. 119, p. 239-47 (observations in 1899 and 1900).

1901 **Felt, E. P.** Hessian fly. Country gentleman, May 30, 66:442 (remedial measures); Hessian fly, June 13, p. 486 (request for data); *same* N. Y. farmer, June 13, p. 8; — June 27, p. 7; Am. agric. June 22, p. 816, col. 1; Hessian fly in New York. Country gentleman, Oct. 3, 66:799-800 (summary account of injuries in 1901 and remedial measures).

1901 **Forbes, E. B.** Minn. agric. exp. sta. Press bul. 13, p. 1-11 (brief general account).

1901 **Garman, Harrison.** The Hessian fly. Ky. agric. exp. sta. Bul. 96, p. 193-98 (period of flight and oviposition).

1901 **Marlatt, C. L.** U. S. dep't agric. Farmers bul. 132, p. 13-22 (brief general account).

1901 **Powers, S.** Hessian fly. Country gentleman, Oct. 31, 66:889 (historical notice and remedial measures).

1901 **Roberts, I. P., Slingerland, M. V. & Stone, J. L.** Hessian fly. Cornell univ. agric. exp. sta. Bul. 194, p. 239-60 (summary account for 1901).

1901 **Slingerland, M. V.** Hessian flies and rag weed. Rural New Yorker, 60:612 (Hessian fly does not breed in rag weed; use of decoy strips); Facts about fly proof wheat, 60:627 (notes on the resistance of various varieties).

1901 **Wadhams, S. W.** Hessian fly. Country gentleman, Sep. 12, 66:740 (results obtained with trap crop); Traps for Hessian fly. Rural New Yorker, Oct. 5, 60:674-75 (method of using trap crop).

1901 **Webster, F. M.** Hessian fly in the middle west. Rural New Yorker, 60:219 (parasites bred abundantly).

1901 **Webster, F. M.** Wheat and Hessian fly. Rural New Yorker, 60:537, 553 (notes on conditions from various localities).

1902 **Felt, E. P.** U. S. dep't agric. div. ent. Bul. 31, new series, p. 22-24 (injuries in 1901).

1902 **Stedman, J. M.** More important insects injurious to wheat in Missouri. Mo. state bd agric. Rep't 1902. Separate p. 23-34 (general account).

NOTES FOR THE YEAR

The following records include some of the more important observations made during 1901. Special attention has been given to forest and shade tree insects throughout the summer. Systematic collecting was pursued at Karner, 7 miles west of Albany, where there is an admirable growth of scrub oaks and small hard pines. These conditions were excellent for securing all the insects affecting these trees, and the results of the season's work, together with that of previous years, will be incorporated in a special bulletin on forest insects now in preparation. The notes relating to the various species mentioned below have been grouped under convenient heads, so that they may be of greater service to the parties interested in the practical aspect of the work.

Fruit tree pests

Fruit tree bark beetle, *Scolytus rugulosus* Ratz. This insect appears to be on the increase in various parts of the state, as several complaints and personal experience seem to indicate. Our report for 1900, p. 989 (N. Y. state mus. bul. 36) records an attack by large numbers of the beetles on a peachtree Sep. 7. May 22, 1901, in the same locality our attention was attracted to some young plumtrees, from which a large proportion of the bark had been stripped, and investigation showed that the bark and sapwood of these trees were almost alive with pupae of this insect. The woodpeckers had found them out, and had literally stripped the bark from the infested trees and splintered the surface of the wood in their efforts to get at the pupae. A hairy woodpecker, *Dryobates villosus* Linn., was



FIG. 6 Work of woodpeckers on plumtree infested by fruit tree bark beetle (original)

observed in the vicinity of the trees, and it was probably this species which preyed on the bark beetles. This is a striking

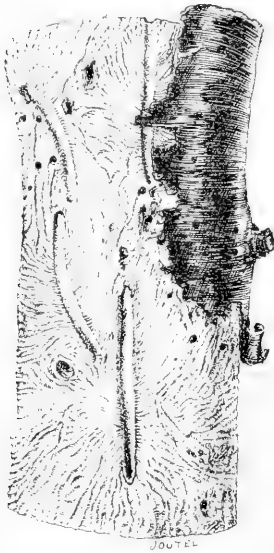


FIG. 7 Work of fruit tree bark beetle in plum (original)

illustration of the value of woodpeckers and their perseverance in digging out such small insects. These pupae were undoubtedly the progeny of the fall brood of beetles, which were observed Sep. 7, 1900, entering trees in large numbers. Aug. 1, 1901, adults of *Scolytus* in some numbers were entering the bark of a young dying appletree, a victim of *Saperda candida*, at Pittstown N. Y. The bark beetles gnawed many minute holes about $\frac{1}{16}$ of an inch deep and of the same diameter. Some of these holes were deserted, and in other places the beetles were at work making the primary entrance or beginning

a gallery. This observation in connection with the preceding ones shows very clearly that the fall brood of beetles, if there be a distinct one, as is very probable, extends in the eastern part of New York state from Aug. 1 till Sep. 7 or later. This is still further confirmed by our finding at Ripley N. Y. Sep. 5, 1901, beetles entering plumbtrees in large numbers.

The presence of pupae and recently transformed beetles in the plumbtrees examined May 22 would indicate that the adults would probably have emerged within a short time. There are therefore at least two generations annually in New York state, and the short period necessary for the completion of the life cycle permits more. It may be that more do occur, but there does not appear to be any good evidence to that effect, at present. Another cheering feature in the last mentioned attack was the breeding of numbers of the beneficial parasite known as *Chirophycolon* Linn.

Grapevine fidia, *Fidia viticida* Walsh. This pest has become thoroughly established in some of the vineyards about Ripley N. Y., where it has already destroyed several and is seriously injuring others. An examination of the infested locality early in September 1901 showed that the badly infested area was still quite limited, though the beetles were known to occur in small numbers over a considerable tract. Mr F. A. Morehouse stated that he found the pest most injurious to those vines from which the earth had been plowed away more or less,

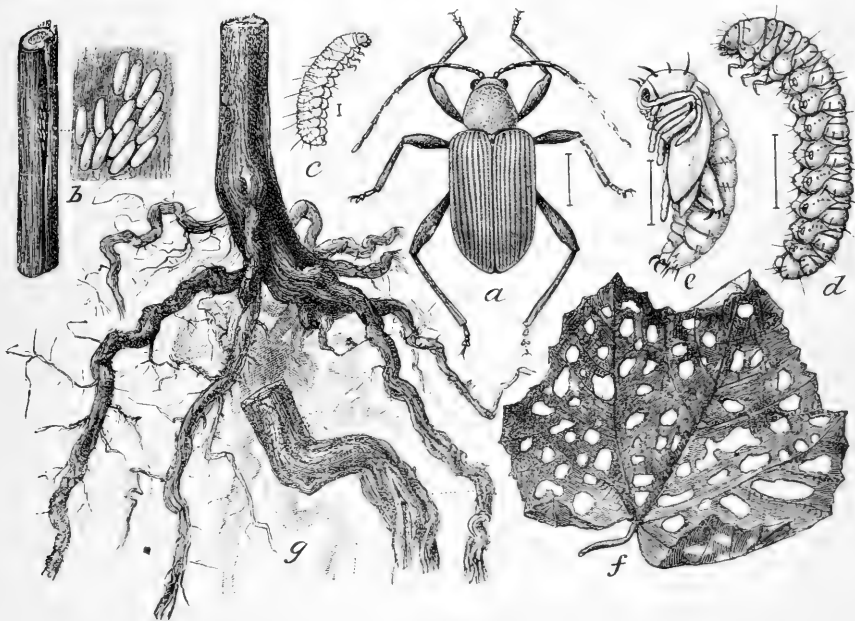


FIG. 8 *Fidia viticida*: a beetle; b eggs represented natural size under fold of bark and much enlarged at side; c young larva; d full-grown larva; e pupa; f injury to leaf by beetles; g injury to roots by larvae—b (in part) and f and g natural size, rest much enlarged. (After Mariatt, U. S. dep't agric. Yearbook 1895. p. 392)

thus affording the larvae a better opportunity to get at the roots, while those well protected by earth suffered comparatively little. This is certainly worthy of further trial; and, while it can hardly be expected to afford absolute immunity, it may decrease the injury materially. Spraying the vines toward the last of June or early in July with arsenate of lead, preferably using the prepared paste form now on the markets, will do considerable to lessen the damage by poisoning the

beetles before they have had an opportunity to deposit many eggs.

It is worthy of note that this species had been in the eastern part of New York state for a number of years without attracting attention by its ravages. Specimens of this beetle were taken by the late Dr Lintner June 30, 1880, at Schenectady N. Y. and on Virginia creeper at Albany July 20, 1882. The 25th of last July this pest was rather abundant on Virginia creeper at Albany, yet no serious injury to grapevines in this vicinity has been observed.

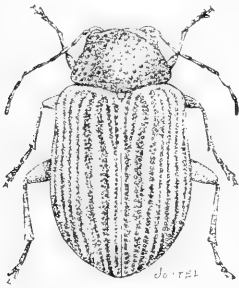


FIG. 9 *Colaspis brunnea*, much enlarged (original)

Brown colaspis, *Colaspis brunnea* Fabr. This pest, in company with *Fidia viticida* Walsh and *Systema hudsonias* Forst., was received from Fredonia N. Y. with the complaint that grapevines had been seriously injured. Much of the harm was undoubtedly caused by the *Fidia*; but, as this species of *Colaspis* was present in considerable numbers, and as it is well known as an enemy not only of the grapevine but also of strawberry plants, it probably caused considerable injury. This species was also taken in very small numbers on hard pine, *Pinus rigida*, and on willow at Karner N. Y. July 8. The beetles are very general feeders, having been previously recorded as feeding on such unlike plants as beans, clover, buckwheat, strawberry, potato and corn.



FIG. 10 Appletree borer, adult beetle

Round-headed appletree borer, *Saperda candida* Fabr. A number of severe injuries by this well known pest have been brought to notice during the year. It was quite common and destructive at Pittstown and vicinity, as reported by W. C. Hitchcock, and the reason for this is found in the fact that little or no attention

is paid to its operations. It was not only seriously damaging young trees there, but it was commonly present in greater or less numbers at the base of the older ones. It was found quite abundant in an orchard of young trees in East Greenbush, where seven good sized grubs were taken from the base of a small tree not over 3 inches in diameter. There is no doubt that persistent and thorough digging or cutting out of these grubs and the use of a protective wrapper at the base of the trees are all that is necessary to control this pest. The cost of these measures is very slight compared with the value of the orchard.

Red-headed flea beetle, *Systema frontalis* Forst. The destructive tendencies of this little black, red-headed flea beetle have been noticed in a recent report. This year it was received, in company with other insects, as a depredator on grapevines. It probably, as in preceding cases, had bred in weeds, and, when numerous, turned its attention to more valuable plants.

Forest tent-caterpillar, *Clisiocampa disstria* Hübn. This insect has been a most serious pest in New York state for the last four or five years, and in localities here and there it has proved exceedingly destructive this season. The outbreak of 1901, so far as could be learned, was much more limited in area than in earlier years and confined largely to sections adjacent to where the insect had been specially abundant previously. The caterpillar appears as a rule to be unable to exist in large numbers in one locality for more than four or five years in succession. This is probably to be explained by the local activity of natural enemies. Another marked feature has been the increasing predominance of the pest in orchards. It is perhaps hardly necessary to add that most of the injuries in orchards could have been prevented by timely and thorough spraying.

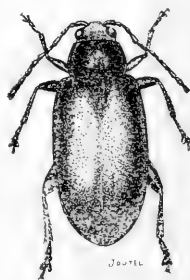


FIG. 11 Red headed flea beetle much enlarged (original)

Cenopis diluticostana Wlsm. The peach twig moth, *Anarsia lineatella*, is a well known boring pest of peach twigs, but the results of this summer apparently show that some other species may be involved and produce very similar injury. The 22d of last June Mr C. H. Stuart of Newark N. Y. sent in peach twigs affected with what he thought was the common peach twig borer. On breeding it, however, it proved to be the above named insect, which was kindly determined by Prof. C. H. Fernald. The notes made at the time on the material sent are of interest and are here transcribed. All the buds had been killed on three or four twigs, 4 to 6 inches long, and those bearing green leaves also had masses of gum of considerable size. The young fruit had also been attacked somewhat. The bark and the sapwood under the masses of fresh gum had been seriously mined. In some places the mines were linear and in others were expanded and very broad. Mr Stuart subsequently wrote that there was hardly a branch of the tree that was not affected, and that many apricot, plum, cherry, apple, peach, willow and other trees for miles on each side were injured, though such an attack had not been previously noted. The trees recovered later, but many small branches were killed.

This insect was described by Lord Walsingham in 1879 in his *Illustrations of typical specimens of Lepidoptera Heterocera in the collection of the British museum*, pt 4, "North American Tortricidae," p. 18. The specimen from which his description was drawn up came from the eastern states of North America. Prof. Fernald in 1882 redescribed this species as *Cenopis quercana* in the transactions of the American entomological society, 10:69. His description of the moth is herewith transcribed.

Head, palpi and antennae, reddish gray in the males, concolorous with the thorax and fore wings in the females. Thorax and fore wings dull rust red. Basal patch, median and sub-apical bands lighter in the males and inclining to yellowish on the costa with strong greenish reflections when seen in an oblique light, showing most strongly in the females. Fringes lighter. Hind wings and abdomen above, light fuscous, lighter beneath. Underside of forewings dull reddish, fuscous on the cell, the lighter markings of the upper side scarcely showing. Expanse, male 14 mm; female, 16 mm.

The specimens from which the above description was drawn were bred from leaves of oak by Prof. Comstock, probably at Ithaca N. Y. and from cultivated cherry by Miss Murtfeldt in Missouri. Prof. Fernald states that there are no other records concerning this insect; and, while most of the above recorded injury to peach twigs may possibly be the work of the peach twig borer, it is certainly of interest to know that this species also attacks the peachtree, and further investigation may show that it is responsible for considerable of the injury. The one bred specimen pupated in a leaf. The empty pupal case was about $\frac{3}{8}$ inch in length, light brown in color, and the dorsum of each of the abdominal segments bore two trans-

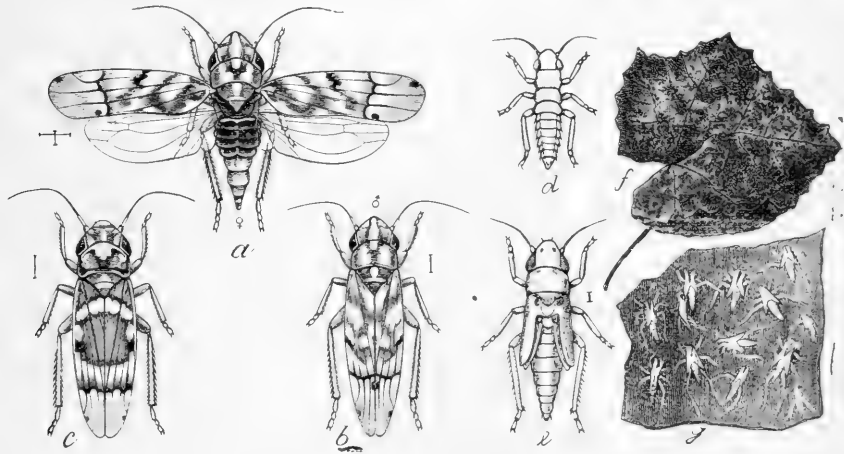


FIG. 12 *Typhlocyba* (sp.): a *T. comes* Say, female; b *T. comes* Say, male; c typical form of *T. vitifex*; d larva; e pupa; f appearance of injured leaf; g cast pupal skins. (After Marlatt, U. S. dep't agric. Yearbook 1895. p. 401)

verse rows of serrations, the anterior rows being very well developed and consisting of from seven to 10 dark, chitinous teeth. The cremaster is dark brown, blunt at the extremity and tipped with six or eight rather stout, though small, recurved spines.

Grapevine leaf hopper, *Typhlocyba comes* var. *vitis*. This little leaf hopper is very familiar to many grape growers, and during the past season it has been exceptionally abundant in parts of the grape-growing districts of Chautauqua county. The foliage in many vineyards was very seriously affected, parti-

cularly the shaded, underleaves. The work of this species was less noticeable in vineyards where clean culture was the rule, although the pest was very generally present.

Shade and forest tree pests

Elm leaf beetle, *Galerucella luteola* Müll. This imported species continues to be a serious enemy of European elms in Albany, Troy and vicinity. The depredations of this pest have been so severe as to lead to the maintenance and operation of two power spraying outfits by the municipality of Albany. Two are also in operation by a private owner in Troy, where they are kept busy throughout the spraying season, each

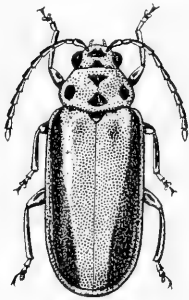


FIG. 13 Elm leaf beetle, adult, much enlarged (reduced from Howard, U. S. dep't agric. Yearbook 1895)

individual paying for the treatment of his own trees. The general condition of the shade trees in both cities is much improved by this work, and, considering all the trees in the streets of both cities, the results are decidedly in favor of Albany. This is probably due almost entirely to the fact that it is much more economical to take a street at a time and spray all the trees than to go hither and thither as desired by private persons. The former is possible only where the city undertakes to spray all the trees on the streets, while the latter must obtain where spraying depends on the will and financial ability of the owner of the abutting property. It might be well to add that as a rule Albanians neglect the trees on their own premises, while people of Troy who have spraying done, invariably include the trees on the premises as well as those in front of the property. The elm leaf beetle has almost undisputed sway in the poorer parts of Troy, because the residents can not afford to have their trees sprayed; while in Albany, these, as well as those inhabited by the wealthier class, are treated, with most beneficent results, because it is in these poorer quarters that shade is most urgently needed. It therefore seems to me advisable to urge the prosecution of such work, when necessary, on municipalities,

rather than to allow it to depend on the enterprise of private individuals, solely because it means the greatest good to the greatest number at a minimum expenditure. This imported pest is slowly extending its range northward of Albany and Troy, and, in some localities where no spraying is done, it is this season proving a scourge to both European and American elms.

The cost of spraying shade trees in cities and villages is a very important matter; and in a former bulletin¹ some attempt was made to ascertain the expense connected with such operations. Figures at that time gave the cost as ranging from about 15c to 56c a tree. Some recent estimates have come into my possession regarding the cost of spraying in Albany and its immediate vicinity. Mr H. W. Gordinier states that in Lansingburg N. Y., where he had a contract to spray all the trees in the village and where most of the elms are very large, the cost per tree for one spraying averaged about 23c, while in Troy, where he sprays the trees of private individuals here and there over the city and is necessarily obliged to travel considerably to go from one lot of trees to another, the cost of spraying ranges from 50c to 60c a tree for each spraying. In both cases the rather more expensive arsenate of lead was used. Both of these figures apply to elmtrees infested with the elm leaf beetle; and, as all who have had experience with this pest know, it requires very careful and thorough spraying in order to obtain satisfactory results. The average cost per tree for spraying in Albany in 1901, using 5 pounds of Bowker's disparene to each 100 gallons of water, was 22c, and the average number of trees sprayed per day by each power spraying outfit was 40. Two were operated under one foreman. However, it was found that, where the trees were small and of a nearly uniform size, such as Norway maples about 30 feet in height, 180 trees could be sprayed in one day.

The village of Saratoga Springs undertook to spray its many large maple trees, ranging in height from 20 to 80 feet, in 1900,

¹N. Y. state mus. Bul. 20. 1898. p. 21-22.

and for that purpose it purchased two power spraying outfits, each provided with an elevating apparatus such as is commonly seen on repair wagons of electric roads. With such an outfit it was found that the average cost per tree for each spraying was $17\frac{1}{4}c$. Mr Wells, superintendent of streets, is of the opinion that this elevating apparatus is a great saver in time and money. It should be borne in mind, however, that the maple trees at Saratoga were not infested with the elm leaf beetle, but with the forest tent-caterpillar, and that spraying in the case of the latter insect is much easier than in the case of the former, and the cost would therefore be much less.

The work in Albany was done under the civil service regulations, and, owing to local conditions, the foreman was unable to exercise desirable selection in the choice of his men. Mr W. S. Egerton, superintendent of parks, in commenting on the situation remarks as follows: "An active energetic foreman, understanding thoroughly the requirements of the service, and having authority to *select* his men for special qualifications as to handling and climbing ladders and spraying properly, could cover much more territory, more effectually and at much less cost per tree, than the eight hour limit and the civil service regulations permit under the present system." He further remarks concerning the force employed in the operation of the power outfit, which in the city of Albany consisted of a driver, a motorman and two spraying men: "The force used on the motors could, under private enterprise, be reduced to three men to each motor, the motorman and driver being one and the same person and two sprayers, making three operators."

It will be seen by the above that there is an opportunity even with these comparatively low figures to reduce still further the cost of spraying trees without marring the efficiency of the work. The trouble with a great many persons wishing to have spraying done is that they fail to see the necessity of insisting on thorough work, and they are very apt to consider the work cheap if a large number of trees are covered with the poison, whether or not the work be thoroughly done. As a matter of

fact, such work may be very dear, because it may accomplish practically nothing. The public need to appreciate the fact that, unless spraying is thoroughly done, it is better not to attempt any such work.

European willow gall midge, *Rhabdophaga salicis* Schrk. European willows are used to a considerable extent in and about Rochester and other nursery centers for the purpose of binding nursery stock into small bundles; and any attack made on plantations of young willows is therefore of some economic importance. Mr H. C. Peck called our attention in November 1898 to some galled willows which he found in a small block owned by T. C. Wilson of Brighton N. Y. The insects live in the stems of the willows, and by the production of their galls made them brittle and unfit for tying purposes.



FIG. 14 Venation of *Rhabdophaga salicis*, much enlarged (original)

Repeated attempts were made to secure the identification of this insect from European authorities but, owing to rough usage and possibly inspections of mail matter, nothing more definite than a generic reference could be obtained, till fresh galls were sent in the spring of 1902 to Prof. J. J. Kieffer, the well known authority on this group, who kindly determined the species. These repeated failures rendered it advisable to characterize the insect, and the following description was in type before the determination was made and it is hoped that this study of a member of the genus *Rhabdophaga* may prove of value to those interested in this group.

The extreme length of the adult female is about 3 mm. The eyes are black, finely granulated, emarginate anteriorly, confluent in the male and nearly so in the female. The antennae

are 17 jointed and in the male are about the length of the insect. The first joint is subconical, second ovoid and the remainder are pediceled, the pedicel being nearly as long as the enlarged part. The bulb of each segment is irregularly setose, with the hairs as long or longer than the entire segment. Certain of the light dots are connected by lighter strips which appear on focusing to be slightly below the surface of the seg-

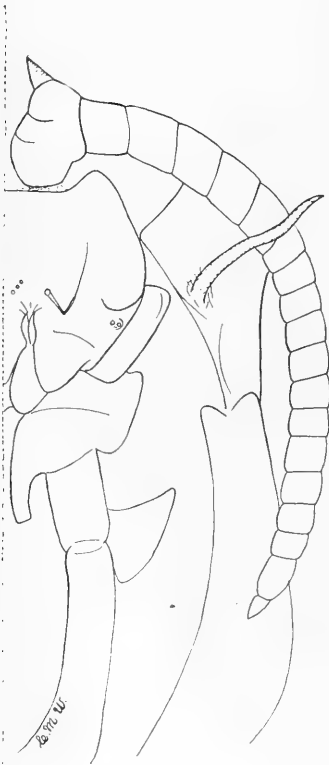


FIG. 15. Ventral aspect of pupal skin of *Rhabdophaga salicis*, much enlarged (original)

ment. The female antenna is about one half the length of the insect, the first and second segments being about the same as in the male. There are lines of light dots on each segment much like those recorded for *Diplosis setigera* Lintn. Each joint is also irregularly ornamented with setae, about as long as the segments, that arise from large, pitlike depressions. The characters of male and female antennae are shown on plate 2, figures 5, 6. The two distal segments are occasionally fused together. The palpi are four-segmented, the two distal joints are nearly equal in length, the basal joint is the shortest and the second intermediate. The thorax is ornamented with two converging rows of silvery hairs, and a short row of smaller ones occurs on

each humeral angle, and the metathorax is tipped with a transverse row of the same vestiture. The wings are sparsely covered and well fringed with fuliginous hairs. The venation is represented in figure 14. The halteres are long, slender and tipped with pale yellow. The legs are very long and slender, claws bifid, toothed and with well developed empodium

(pl. 2, fig. 3, 4). The distended abdomen of a gravid female is dark red, the color evidently being derived from the contents. The abdomen of the male is nearly black, and the clasps are tipped with two very short, minute teeth.

The puparium is subconical, about 3 mm long, with the anterior two thirds a dark straw yellow and the posterior third a dark rufous.

The cephalic horns of the pupa are pointed, confluent at the base and of a height equal to their greatest width. The prominent dorsal processes are slender, slightly crooked when observed from the side and with a length equal to about one third of the diameter of the pupa (fig. 15). The slender, setaceous processes are shown at plate 2, figure 2. The pupal mandibles are four toothed, tipped with light brown chitinous and the ventral tooth is nearly twice the size of the one next it which in turn is larger than the others. All curve some and taper to acute points.

The larva is stout, orange red, with 11 easily distinguished segments. It is about $3\frac{1}{2}$ mm long, and the "breast bone," or sternal spatula, is nearly black, enlarged slightly at both extremities and two toothed anteriorly (pl. 2, fig. 1).



FIG. 16 Caterpillar of carpenter moth (original)

The reddish orange eggs are deposited on the leaves by captive flies in irregular clusters or groups of three to six or more, frequently side by side. They are lanceo-elliptic in outline and about $\frac{3}{10}$ of a mm in length.

This insect produces many celled galls in the stems of small willows. At the time the insects appear, the bark over the infested part turns brown or black and, the pupae working partly through a circular orifice, discloses the imago. The pupal case remains projecting from the gall, and usually there

are enough individuals in one gall to give an empty one a very characteristic appearance on account of the whitish, projecting pupal cases. A gall is represented at pl. 4, fig. 1.

Adult flies were obtained from May 22 onward, from material received on the 10th, and on the 31st a parasite was bred. This was kindly identified by Dr Ashmead of the United States national museum as *Tridymus salicis* Nees, a species recorded for the first time in America. *Tridymus metallicus* Ashm. was bred in small numbers from galls received in the spring of 1902 and *Polygonotus salicicola* Ashm. was reared in numbers. This abundance of parasites leads us to

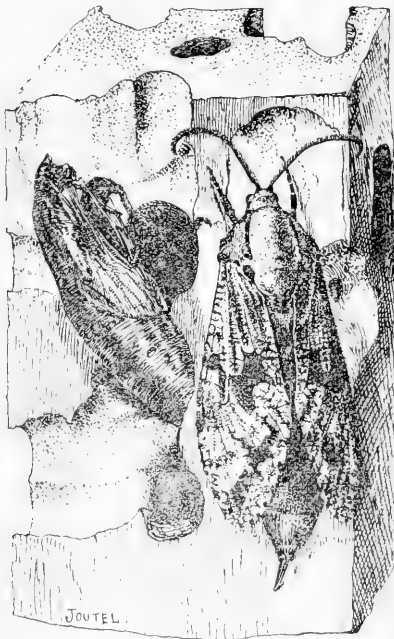


FIG. 17 Work of carpenter moth caterpillars, pupal case and adult (original)

hope that natural agents will soon control this pest. Twigs received June 3, 1901, directly from the willow plantation had disclosed some flies, showing that the period of emergence extends over a number of days. Mr Peck further states that Mr Wilson has been in the habit of opening cases of imported stock near the block of infested willows; so it would be comparatively easy for them to become infested.

Carpenter moth, *Prionoxystus robiniae* Peck. This is a serious enemy to maple, oak and ash trees in certain sections of New York state. Its destructive work at Ogdensburg was brought to my attention by Miss Mary B. Sherman of that place, and through her some interesting examples of the borers' work in sugar mapletrees were secured. One third of a section of a tree about 15 inches in diameter was fairly riddled with the large burrows of the caterpillar of this insect. It was so abundant as to

ruin a number of fine trees in that locality and necessitate their removal. The work of this pest at Buffalo was brought to my notice by Mr M. F. Adams of that city, and through his kindness I have been able to secure good examples of the insects' work in ash and to observe its operations in oaks. This species also occurs on Long Island. All the examples of its work seen by me show that the full grown caterpillars prefer to run their burrows at some depth in the wood, and that as a rule they run so close to and communicate so freely with one another as to destroy the value of infested trees for timber. This insect also causes large unsightly wounds wherever its burrows come near the surface. Caterpillars about to pupate frequently take refuge in these channeled wounds, from which the pupae work themselves partly out before the disclosure of the imago. The eggs are probably deposited in any available crevice, where they adhere to the bark rather firmly. A piece of root which had been bored by the willow curculio, *Cryptorhynchus lapathi* Linn., was lying in a breeding cage, and a female *Prionoxystus* embraced the opportunity to deposit six or seven eggs well within the burrow.

Apparently the females do not hesitate to oviposit before the appearance of males. Some eggs which were found in the office hatched, possibly without being fertilized, but it was impossible to prove the latter point. Dissection of a well distended female which probably had deposited no eggs, showed that she contained 269 well formed ova and 133 which were partly developed, making a total of 402.

Leopard moth, *Zeuzera pyrina* Fabr. Late in January a communication was received from C. H. Stuart, Newark N. Y., accompanied by an imported quince seedling infested with the larva of this notorious pest. It was stated in the letter that all of the stock with which this stock came would be fumigated before it was set out. This pest, as is well known, has proved and is now a very serious enemy to shade trees in and about New York city; and it is only a question of time when it will become more widely distributed in the United States. It is one

of those forms that can not be controlled by fumigation; and, inasmuch as it is known to have been established in New York city and vicinity for nearly 20 years, it is surprising that it has not spread more rapidly. See pl. 3 for an illustration of the insect and its work.

Birch leaf bucculatrix, *Bucculatrix canadensisella* Chamb. Last fall the white birches all about Albany were very badly affected by a small caterpillar which ate away the tender, under portion of the leaves. The skeletonized parts dried, turned brown, and the trees looked much as if they had been injured by fire. This year the pest appears to be even more numerous, having been very abundant about Albany. Its work was also observed all through the western two thirds of Massachusetts, and it has been reported as quite injurious in several localities in the northern part of New York. This attack is not unprecedented, though of considerable interest on account of its covering so large a territory. This insect was reported to Dr Lintner as injurious about Scottsville, Monroe co., in 1886, and in 1891 it seriously injured birches about Ausable Forks N. Y.

The parent of this caterpillar is a little, brownish white moth with a wing spread of but $\frac{3}{8}$ of an inch. The caterpillar is a delicate, yellowish green creature about $\frac{1}{4}$ of an inch long when full grown. During the last half of August and the first half of September many can be found curled up under a white, silken covering known as the molting cocoon. Later a beautiful, white, ribbed cocoon will be constructed in which the winter is passed. Pl. 4, fig. 5 illustrates well the appearance of the insect in its various stages.

Valuable trees can be protected by spraying with an arsenical poison, preferably arsenate of lead, taking special pains to get the poison on the under surface of the leaves. It is to be expected that natural agents will soon reduce the numbers of this tiny pest and thus prevent the ultimate killing of the trees.

Golden oak scale, *Asterolecanium variolosum* Ratz. White oak twigs received from Yonkers N. Y. Sep. 16 were literally covered in places with this insect. The scales

are a little less than $\frac{1}{16}$ of an inch in diameter, nearly circular in outline, strongly convex and varying in color from a light golden yellow to a dark brown. They are usually bordered by a line of white excreted matter, and on badly infested twigs the edges of one scale may overlap those of another. The removal of a scale will reveal a distinct hollow in the bark, showing that

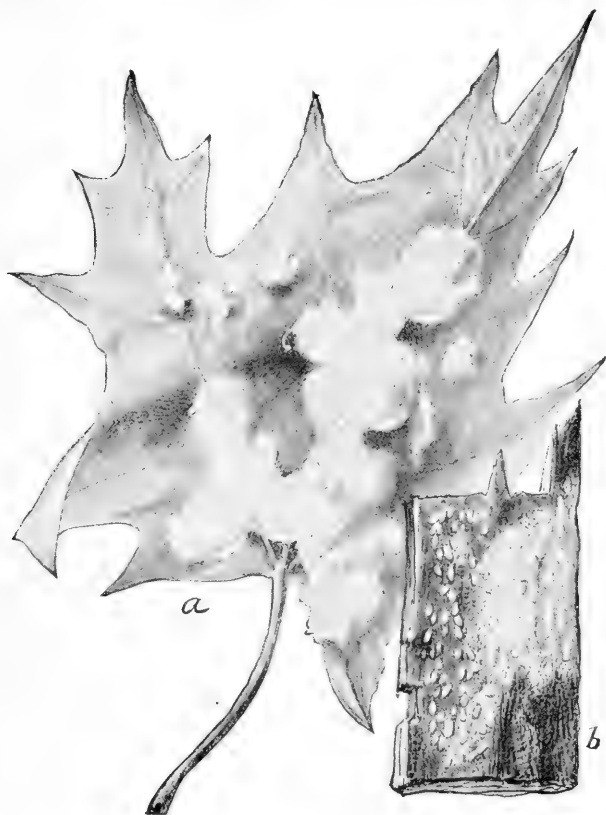


FIG. 18 *Pseudococcus aceris*: *a* adult females on leaf; *b* young female and males on bark. Natural size. (After Howard, *Insect life*, 1894, 7:235)

the growing bark has developed around rather than under the insect. This scale insect has been quite injurious in earlier years to English oaks at Geneva N. Y., apparently doing more harm to large trees.

The young of this scale insect begin to appear in the latitude of Washington D. C. about the first of May, but Prof. Lowe, in his report for the year 1895, states that at Geneva N. Y. the

young had not begun to appear May 29. The young may be expected in the latitude of Yonkers about the middle of May and later; and thorough spraying at intervals of about a week, as long as the young appear, with kerosene emulsion, diluted with nine parts of water, will probably be found very effective in checking this pest. Aim to cover every part of the infested tree with the insecticide.

The small *Lecanium nigrofasciatum* Perg. has proved a rather serious enemy to soft maples in Albany. This scale insect has been so abundant on some small trees as nearly

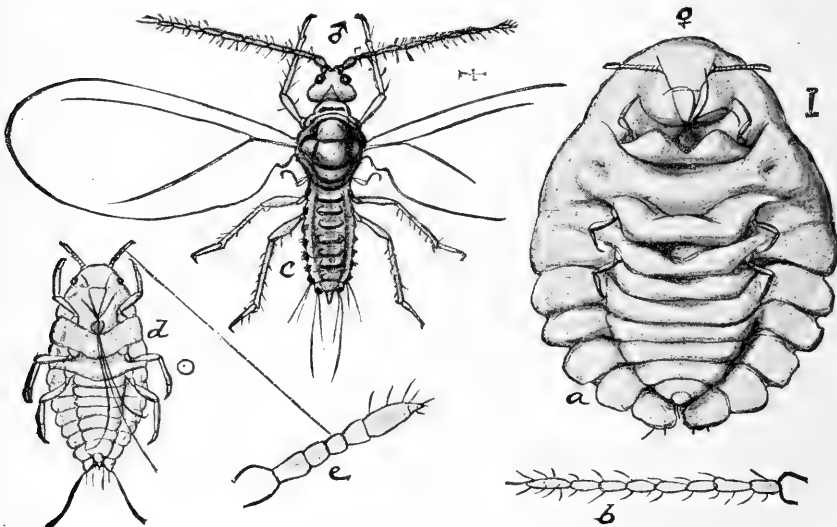


FIG. 19 *Pseudococcus aceris*: a adult female; b antenna of same; c adult male; d young larva; e antenna of same—a, c, d greatly enlarged; b, e still more enlarged. (After Howard, *Insect Life*. 1894. 7:237)

to cover the under surface of the limbs, and so much honeydew was exuded that the walks beneath were kept moist. The severe drain on the trees prevented much growth and resulted in killing a number of the smaller limbs. Badly infested twigs have a marked sour, semiputrid odor due in all probability to the decomposition of the honeydew. Young began to appear in Albany about June 14, and by July 15 they were about .5 mm long and were thickly set on the smaller twigs (pl. 4, fig. 2).

Pseudococcus aceris Geoff. This comparatively rare species was observed in immense numbers on the bark of a hard maple at Albany N. Y., August 6. It was also observed in considerable numbers on hard maples at Worcester Mass. The male cocoons were present in thousands and in places formed large white masses on the trunk, giving a tree the appearance of being affected by a fungus. Some immature individuals were wandering over the masses of the male cocoons. The leaves were also badly affected. The cottony remains of adults were abundant, and here and there old females were still producing young, as a number of very small individuals were observed, and partly grown ones were assembled on the under surface of the leaf in long rows on both sides of the principal veins. There is a marked, subacid, not unpleasant odor about this species when present in large numbers. It is not nearly so offensive as *Lecanium nigrofasciatum* Perg.

Chermes pinicorticis Fitch is always more or less injurious to white pines in Washington park, Albany, but this year it has been exceptionally abundant, not only giving considerable portions of the trunk a whitewashed appearance but literally plastering the under surface of many limbs. A number of these pines, as a consequence, have a thin foliage and are sickly. It was also observed in numbers on white pines at Round Lake N. Y.

Garden and other insects

Blister beetles. Several species were brought to notice through the depredations of the adults on various plants. The striped blister beetle, *Epicauta vittata* Fabr., attacked beets, potatoes, beans and tomatoes about the middle of August, at Valatie, Columbia co. It was reported as very numerous and to have devoured all the beets and tomatoes and then to have attacked potatoes. The exceedingly common black blister beetle, *Epicauta pennsylvanica* DeG., suddenly attacked sugar beets about the same time at Cobleskill, Schoharie co., and some patches were destroyed. The latter part of August, this species was reported as injurious to potato vines

and China asters at Charleston Four Corners, Montgomery co., the beetles appearing to prefer the half grown aster blossoms.

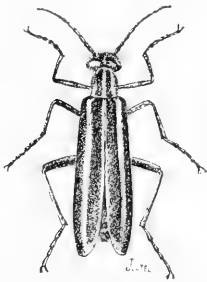


FIG. 20 Striped blister beetle, enlarged (original)



FIG. 21 Black blister beetle, enlarged (original)

The margined blister beetle, *Epicauta cinerea* Forst., is another common and occasionally a very annoying species.

Owing to the fact that several species of these beetles are known to be beneficial in the grub stage, preventive rather than

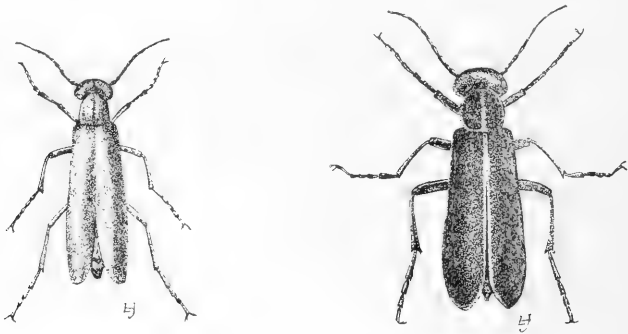


FIG. 22 Margined blister beetle, enlarged (original)

destructive measures have uniformly been urged for their suppression.

Pale striped flea beetle, *Systema taeniata*. This little pest was very common and quite injurious in an eight acre bean field at South Byron, Genesee co. The field had been sown the previous fall to wheat, which was destroyed in early spring by Hessian fly, and then it was again plowed and planted with beans. The weeds growing in the grain undoubtedly supplied the flea beetles with shelter and provender, and, when they were

destroyed, the insects waited with more or less patience for the appearance of something green. It is well known that this and allied species thrive on weeds, and, while clean culture may not be possible in a grain field, there is rarely a necessity of sowing after grain a crop which these little pests can seriously injure. If such a course be unavoidable, they can be controlled by spraying the plants early with a poisoned bordeaux mixture.

Fringed anthomyian, *Phorbia ? fusciceps* Zett. The bean fields in several parts of the state suffered considerably from the attack of some insect. The trouble was first brought to our attention by J. F. Rose, South Byron, Genesee co., and July 10 a number of fields were visited in his company. A great many bare stalks occurred in several fields, and on investigation it was found that much of the injury of this character must have been caused by a maggot working on the delicate plumule before the plants broke ground and probably before the process of germination had much more than begun. A number of these bare stems were found to be even then infested with dipterous maggots, which were working in the stalks and producing large cavities surrounded by brownish, partly decayed tissues. The species was identified provisionally from larvae taken under such conditions. Unfortunately, we were not able to obtain adults and thus make an authentic determination possible. The greatest injury was observed in a field which had been sown to wheat the previous fall and through the activity of the Hessian fly had been destroyed. This field had been plowed and planted to beans. The reason for greater injury on such fields is probably found in the fact that grain offers abundant food for such insects, and, when this is suddenly destroyed, the insects naturally turn to the most available crop, and in the case of a thinly planted one like beans, serious injuries may result. Newspaper reports mention a similar trouble in Orleans county.

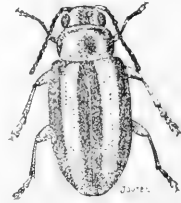


FIG. 23 Pale striped flea beetle, enlarged (original)

Cacoecia parella Rob. Moths of this species, kindly identified by Prof. C.H. Fernald, of the Massachusetts agricultural college, Amherst, were bred July 22 to 28 from larvae occurring singly in nests composed of the webbed together terminal leaves of sweet melilot shoots. The caterpillars were quite abundant June 4 to 13 in one small patch of this common weed at West Albany. This species is comparatively new to economic entomology, having so far as known been noticed but twice. It was bred by Dr J. B. Smith,¹ state entomologist of New Jersey, from similar webs occurring on cranberry bushes, and he also observed it on adjacent "loose strife." Larvae of apparently the

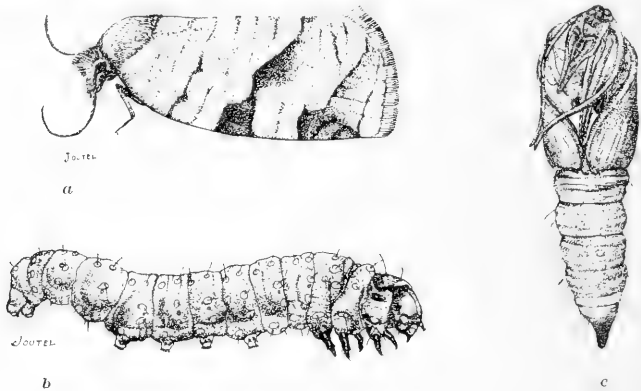


FIG. 24 *Cacoecia parella*: a moth, b caterpillar, c pupa, all much enlarged (original)

same species were observed on cranberry near St Anthony park, Minn., by the late Dr Otto Luggler,² formerly state entomologist of Minnesota. William Beutenmuller records it as feeding on willow and aster.³

As the larvae differ somewhat in color, being characterized as reddish with yellow heads by Dr Smith in his report for 1892, a description is given herewith.

The full grown caterpillar is about $\frac{7}{8}$ inch long. Its head and thoracic shield are amber colored. The latter is bordered laterally and posteriorly with irregular black markings and orna-

¹N. J. state agric. exp. sta. Rep't 1892. p. 440.

²University of Minnesota. Agric. exp. sta. Bul. 61. 1898. p. 283.

³Amer. mus. nat. hist. Bul. 4. 1892. p. 80.

mented with a pair of dark spots on the anterior border near the median line. The body is a rather dark green and bears large, whitish, quite conspicuous tubercles, each with one to three hairs or setae. The anal plate is rather prominent and dark brown posteriorly. The true legs are black and the false or prolegs are a yellowish green color. Described from a number of living specimens. The pupal shell is about $\frac{1}{2}$ inch long, brown in color. The cremaster is black and ornamented with about eight or nine recurved hooks.

Squash bug, *Anasa tristis* DeG. This common and disgusting pest of the squash and other vines has been unusually

troublesome and destructive the past season. A number of complaints have been received from various sections of the state. The experience of state botanist Peck may well serve as an example. After an absence of about two weeks, he took 63 adult bugs from four hills of squashes, and two hills had but a single plant each. The squash leaves were fairly covered with eggs, and others were deposited on adjacent raspberry and plum leaves, as well as on cucumber vines.

Garden flea, *Smynturus hortensis* Fitch. Though this insect is said to occur abundantly during May and June in gardens in New York state, it is rarely brought to the attention of economic entomologists. Its small size and quick movements have undoubtedly deterred many from trying to capture it, but this difficulty was ingeniously solved by Mr C. E. Ford, Oneonta N. Y., who

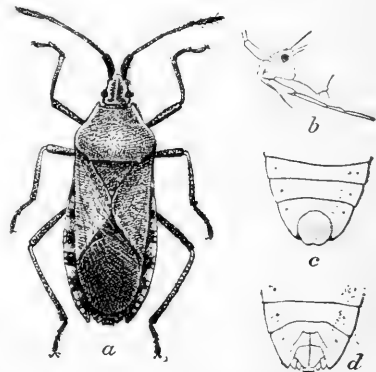


FIG. 25 Squash bug: *a* adult female twice natural size; *b*, *c* and *d* details of structure more enlarged (after Chittenden, U. S. dep't agric. div. ent. Bul. 19, new series)

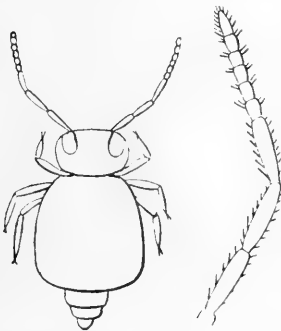


FIG. 26 Garden flea, much enlarged (after Fitch)

smeared molasses on a piece of cardboard, gummed it in the bottom of a small box and, while the molasses was still fresh, clapped it over the insects. Their jumping brought them into contact with the sticky surface, and there they remained secure and alive till they reached the office. Mr Ford stated, under date of May 31, that this species was particularly injurious to melon and squash vines. The general form of the insect, though much enlarged, is shown in the accompanying figure. It is a broadly oval, black or dark colored insect less than $\frac{1}{10}$ of an inch in length, wingless but provided with short, thick hind thighs and also a peculiar, ventral springing fork. The latter structure is peculiar to insects belonging to the same order, Thysanura, and it is on account of this peculiar organ that these insects are frequently known as "springtails." Dusting affected plants thoroughly with plaster or ashes or, better still, spraying them with a poisoned bordeaux mixture should control the pests.

Rabbit botfly, *Cuterebra ? eunuculi* Clarke. This species, closely related to the "warble fly" of cattle, which is frequently known as "grub-in-the-back," was twice brought to notice during the season—once, when infesting Belgian hares, and in this instance the identification was in all probability correct. The second case was that of a kitten four months old, owned by D. F. Meskil of Highland Falls N. Y. The history of the case as stated by Mr Meskil is as follows. About Aug. 7 the kitten "developed an abrasion on his side, midway between the hind and fore quarters and 1 inch below the spine. It rapidly developed into a suppurating protuberance," and by the 16th it was "an inch and a half long and as thick as a man's thumb." It will be noted that this is just about the position where this larva develops on the rabbit. The sore was cut open, and a grub $\frac{7}{8}$ of an inch long and nearly half an inch in transverse diameter removed. The grub resembles the one from the Belgian hare very closely, and they probably belong to the same species. It only remains to add that the kitten recovered rapidly after the removal of this disgusting pest. The accom-

panying figure gives a very good idea of the appearance of this grub. An examination of one, with even a common hand lens, will show that its dark brown color is due to a multitude of pointed, chitinous pyramids, which literally cover the nearly white skin, and one has only to imagine such a creature working about in a sore, to obtain some idea of the pain inflicted. The parent fly is about the size of a bumblebee and much resembles that insect. It has a black head, yellow brown hairs on the dorsum of the thorax, yellow hairs on the first segment

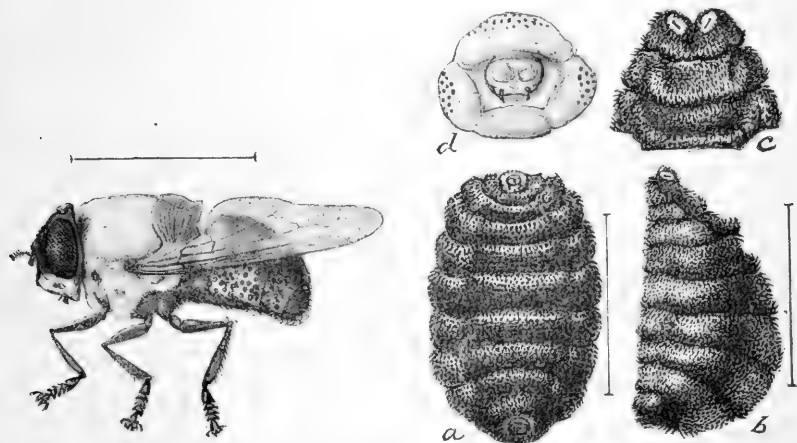


FIG. 27 *Cuterebra cuniculi*: side view; *a* larva, ventral aspect; *b* pupa, lateral view; *c* anterior extremity; *d* hooks and anterior spiracles of larva—all enlarged. (After Osborn, U. S. dep't agric. div. ent. Bul. 5, n. s. p. 149)

of the abdomen and the remaining segments of a blue-black color. It is represented in the accompanying figure.

European praying mantis, *Mantis religiosa* Linn. This beneficial insect was discovered by Mr Atwood in 1899 at Rochester N. Y., where it had undoubtedly been brought on imported nursery stock. Several notices of the introduction of this insect have been published by Prof. M. V. Slingerland, who has also issued an interesting bulletin¹ on this species. It has now become quite abundant in Rochester, and last spring an effort was made, through the kind cooperation of Mr Atwood, who sent 227 egg clusters, to introduce this beneficial insect into

¹Cornell univ. agric. exp. sta. Bul. 185.

other parts of the state. Seven to eight egg clusters from this lot were sent to the following persons: C. L. Allen, Floral Park, H. S. Ambler, Chatham, M. H. Beckwith, Elmira, R. L. Darrison, Lockport, O. Q. Flint, Athens, S. H. French, Amsterdam, J. T. Gaylord, Poughkeepsie, G. S. Graves, Newport, W. G. Hitchcock, Pittstown, S. B. Husted, Blauvelt, H. D. Lewis, Annandale, E. H. Mairs, Irvington-on-Hudson, L. L. Morrell, Kinderhook, Paul Roach, Quaker Street (Schenectady co.), E. T. Schoonmaker, Cedar Hill, C. H. Stuart, Newark, Franklin Taber, Poughkeepsie and C. L. Williams, Glens Falls. Each lot was also accompanied by a letter directing the recipient to keep the eggs cool and as soon as possible to tie them to the stem of some bush or to a low branch of a tree. The persons were requested to keep watch for the hatching of the eggs and to report concerning them. A copy of Prof. Slingerland's bulletin was also sent to each. In addition, a number of egg clusters and a few living young were distributed about Washington park, Albany, some in the northeast and a number near the northwest corners of the main part of the park; 15 egg clusters were distributed May 22 about the premises of H. A. Unger, Hillview, East Greenbush; and about as many June 8 in the gorge below Dean's mill, Coeymans N. Y. A number of egg packets were taken to Saratoga N. Y. May 4, a few placed in promising locations, and others given to the street, water and gas commissioners of that village.

It is naturally somewhat difficult for one unfamiliar with this insect to be certain that young mantids hatched from the eggs, and in the majority of instances negative results have been reported. Still it is well to have these localities on record because some of the insects may have escaped unobserved. Mr G. S. Graves of Newport states that during the summer a Mr Morey found one dead adult in a whey vat and a living specimen in the house. They were identified by comparing with an illustration in a dictionary. Mr O. Q. Flint, Athens, reports that some of the egg masses looked as if they had hatched. W. C. Hitchcock, Pittstown, states that he found one freshly laid egg mass. R. L. Darrison, Lockport, succeeded in obtaining between

July 2 and 5, 100 young mantids from an egg mass kept indoors. The young were set at liberty in the vicinity. None of the egg masses put out of doors developed any insects. Mr Darrison states. Messrs Allen, Ambler, Beckwith, Husted, Morrell, Roach, Schoonmaker, Stuart, Taber and Williams reported negative results. J. T. Gaylord of Poughkeepsie was unable to find any young mantids or to discover recently deposited egg clusters; but E. H. Austin of Gaylordsville Ct., to whom he sent a few eggs, discovered several living mantids about an inch or so in length. H. D. Lewis of Annandale found several fresh egg clusters, some of them over 100 rods from where the eggs were planted last spring. This insect should have become established in Albany or its vicinity, but up to the time when this report is submitted, nothing very encouraging has been discovered. Apparently, quite a proportion of the egg clusters failed to hatch, though a number of the young were obtained in the office.

Croton bug, *Phyllodromia germanica* Linn. An excellent remedy for this household pest was reported on last May by Mrs H. D. Crane, Montclair N. J., who found powdered borax to be the best of a number of substances tried. She states that it must be used freely all around the cracks and corners and so placed that the bugs can not get to water without going over it. Her neighbors also had excellent success with this substance. This insect is such a serious pest in some houses that records like the above should be given wide circulation for the encouragement of others. As noted in earlier publications, Hooper's fatal food has also been used very successfully. There are probably other equally good proprietary remedies, but nonpoisonous ones should receive preference about houses.

Unusual abundance of southern forms

A study of climatic conditions is not without value, since it gives a basis for forecasting the probability of insects being able to live in various sections of the country. This is of considerable importance in the case of injurious and beneficial

species, because we are thereby able to ascertain to some extent the limiting agencies controlling them, and the more that is known along these lines concerning various forms, the more accurate will be our judgment as to their possible range. The present year has been marked by the presence in abundance of several interesting species, three of which are mentioned below. The reason for their occurrence in great numbers is probably found in unusually favoring weather conditions, particularly in the more than normal warmth. A study of the monthly mean temperatures during the growing season in the Hudson river valley for this and the preceding four years bears out this conclusion somewhat. The following tables, compiled from the records of the New York state weather bureau and from those of the New York section of the national weather bureau, show this fairly well.

Monthly mean temperature of the Hudson valley region

	May	June	July	August	September
1897.....	59	64.3	73.6	68.6	61
1898.....	57.3	68.8	73.7	71.8	65.9
1899.....	59.7	70.3	72.1	70.8	61
1900.....	58.1	69.2	74.1	73.3	66.1
1901.....	57.6	69.1	74.7	71.4	63.2

June in 1899, 1900 and 1901 was markedly warmer than in 1897 and 1898 and July in both 1900 and 1901 was warmer than the same month in 1897, 1898 and 1899, and this higher temperature is more marked in August 1900, which is just about the time of year when many insects would respond most readily to the influence of heat, specially those in the caterpillar stage, and the more than normal warmth would tend to produce greater vigor than usual in this latitude and a consequent increase in numbers the present year. The increased warmth of the last two years is still better shown in the table of monthly means of Albany, compiled from the same sources as the preceding table.

Monthly mean temperature of Albany

	May	June	July	August	September
1897.....	59	65	75	70	63
1898.....	58.2	69.8	75	73	60.6
1899.....	60	71	73.2	72.3	61.4
1900.....	57.9	70.5	74.6	74.7	67.7
1901.....	59.1	70.2	75.8	72.8	65

It will be seen that June of 1899-1901 was distinctly warmer than in the two preceding years, and, while no other months show as marked difference in mean temperatures, even this means a considerable increase in warmth for the season when accompanied by no corresponding decrease in other months. It is also worthy of notice in this connection that July 1901 was exceptionally warm, as compared with preceding years.

Cicada killer, *Sphecius speciosus* Drury. This handsome, black, yellow marked wasp has been relatively quite abundant about Albany the last summer. A few specimens were taken in the city and at Karner, 7 miles west, it was abundant about scrub oaks, where it appeared to be feeding on the sap

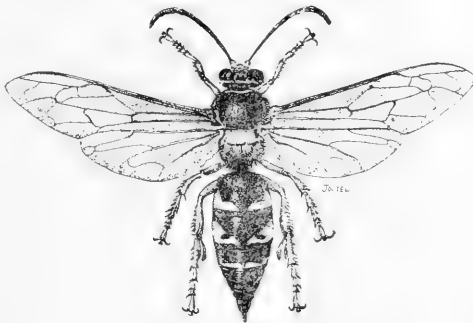


FIG. 28 Cicada killer (original)

exuding from some of the buds. This insect has previously not been recorded so far north, not being known to occur in the Hudson river valley above the vicinity of Poughkeepsie. Its presence and abundance are probably due largely to the more than normal warmth of the last year or two.

Giant swallowtail or orange dog, *Heracles cresphontes* Cram. The larvae of this giant butterfly were unusually abundant last summer. They were sent to the office from Athens, Greene co., Selkirk and Albany, Albany co., Schoharie, Schoharie co., Albion, Orleans co., and Batavia, Genesee co. The report from Batavia states that this insect is something entirely new to that locality. The caterpillars must have been quite abundant at Schoharie, as about 200 were taken from

common "rue" and from *fraxinella*, and a shrub full of "thousands" of smaller ones was also reported. This caterpillar may attain a length of $2\frac{1}{2}$ inches. It is curiously mottled with shades of brown and with two large silvery white patches, one near the middle of the caterpillar, and the other at its posterior extremity, giving it a peculiar, blotched appearance, and making it resemble somewhat the droppings of a bird. It is well represented, with its reddish, fetid osmeterium extended, as is the case when it is annoyed or alarmed, in the accompanying figure.

The above records are in marked contrast to those of pre-

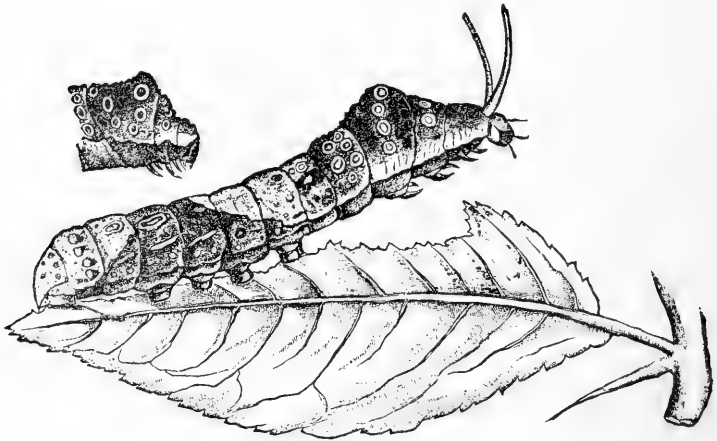


Fig. 29 Orange dog or caterpillar of *Heraclides crespontes*

vious years, the presence of this species in the state having been reported directly to the office but twice before, according to published records, once last year, when our attention was called to its occurrence on *fraxinella* at Altamont, and again in 1892, when it was sent to the late Dr J. A. Lintner from Glen Cove L. I., with the statement that the caterpillars were numerous on *Choisya ternata*. Dr Lintner, commenting on this insect in his report for that year,¹ makes the following statement:

Papilo crespontes is a southern species ranging from the northern part of South America northward. It has gradually extended its range until now it occurs as far north as

¹N. Y. state ent. 9th rep't. 1892. p. 337.

Montreal in Canada. The first record of its appearance in the state of New York was in 1864. Within late years, from being an occasional visitor, it seems to have established itself in Westchester county, and at Poughkeepsie. In other localities in the state it is occasionally abundant, as in Rochester, where, according to Mr Bunker, it "swarmed" one season, several years ago. Prof. L. M. Underwood has written me that on Sep. 12, 1882, he saw several examples flying over the low swales near the Rhinebeck and Connecticut railroad in Columbia county. It has not been observed in the neighborhood of Albany. A single example was taken at New Baltimore, 17 miles south of Albany, in the month of September.

Rose scale insect (*Aulacaspis rosae* Sandb.) This destructive southern species was found June 3 in abundance on blackberry bushes at Hudson N. Y. The young were appearing in considerable numbers at this time. It was breeding in large numbers on cuttings from a crimson rambler rose brought from Cobleskill N. Y. Oct. 18. Adult female scales were abundant and several parasites, *Arrhenophagus chionaspidis* Aur. were observed crawling on the twigs. This scale insect was also sent in on raspberry plants from Cornwall N. Y. This is a species which is brought to attention at infrequent intervals in this state. One reason for this may be found in its general resemblance to the exceedingly common *Chionaspis furfura* Fitch, and it is not at all unlikely that many after a glance have concluded that the scale on the raspberry or blackberry was the scurfy bark louse and therefore not pushed the inquiry further. The species is represented on pl. 4, fig. 3, 4.

EXPERIMENTAL WORK AGAINST THE SAN JOSÈ SCALE INSECT

The tests of various insecticides begun last year were continued in the same orchard during the present season, and in the main the results in 1900 were confirmed, and our confidence in a mechanical crude petroleum emulsion much increased. The chief aim of experimental work along this line is to make comparative tests of various insecticides, and naturally some of the substances used are not so effective as one might desire; yet, in spite of that drawback, the experimental orchard is in much

better condition than it was two years ago. It is only necessary to compare pl. 5, 6 to obtain a relative idea of the value of spraying for San José scale. The experimental orchard was the first in that vicinity to become infested with the San José scale; and two years ago it was composed of a very bad-looking lot of young trees. Today the conditions are reversed, so far as these two orchards are concerned, and the later infested, near by orchard is in much worse shape than the other. It is true, that the former is composed of apple trees set a considerable distance apart, and that naturally makes the orchard look thin compared with the more closely set peach trees and pear trees, but a close examination shows that the true relative condition of the trees is very fairly expressed in the two plates.

The poor results obtained from early spring applications of kerosene and mechanical emulsions of the same in 1900, led to the concentrating of the work on the more promising insecticides, namely, crude petroleum and whale oil soap in various combinations. Two crude petroleums were used, care being taken to make field tests of the oil just before spraying, consequently there can be no doubt regarding its weight as determined by the hydrometer. One of the crude petroleums used was obtained from a local oil dealer handling the products of the Standard oil co. This is a quite fluid, greenish oil, and it gave a field reading of 41.8° Beaumé. It was presumably about the same as that used last year, as it appeared no different and was obtained from the same source. The other crude petroleum was received directly from the Frank oil co., Titusville Pa. This was of a light amber color, and it was said to test from 44° to 45° on the Beaumé oil scale. In the field it gave a reading of 43.3° Beaumé. Both of these tests were made at a temperature of about 65° F. These two crude petroleums, for the sake of brevity, have been characterized in our records as Standard oil and Titusville oil respectively, and these names will be used in the following pages. Comparative tests of mechanical emulsions of both these oils were made, and the results are given below. The spraying was done April 11, which was bright, with at times a rather strong wind.

Substances experimented with. Crude petroleum was tested on a large number of trees, both the Standard and the Titusville oils being used in 20% and 25% mechanical emulsions, and the latter was also used undiluted on a few trees. Good's whale oil soap no. 3 in a solution of 1 pound to 4 gallons of water was used with 10% and 15% Standard oil, the kerowater sprayer being employed, as last year, in making a mechanical combination between the soap solution and the oil. Good's whale oil soap was also used by itself at the rate of 2 and of 1½ pounds to the gallon.

Time and methods. The apparatus, the hand kerowater spraying outfit, was the same as employed last year. The experiments were all in the same orchard, for a diagram of which the reader is referred to pl. 3 of the preceding report. It was undesirable to treat all the trees with the substances used on them in 1900; and it will be seen by consulting the diagram, that the different insecticides have been applied to transverse sections of the orchard. This did not always permit of applying the same preparation to several varieties of pears and peaches, but, on the other hand, it was much easier to keep track of different tests. The numbers bestowed on the trees in 1900 have been retained, and it is thus very easy to ascertain the previous history of any tree by consulting the preceding report.

Supplementary notes. There are several observations which, though not strictly a part of the experimental work proper, may as well be recorded in connection with it, since they were noted in the progress of the work. The young of the San José scale were abundant on trees in the experimental orchard July 3, 1901, and, as there were a number of young in the black stage, they must have begun to appear about a week before. Sep. 25, young were crawling in considerable numbers on relatively few trees, and the same condition was observed Oct. 15. Thus this period agrees with those observed in preceding years, and the breeding season may be said to extend from the latter part of June through October.

There is a brief mention of the occurrence of the little black ladybug, *Pentilia misella* Lec., in my previous report,¹ but this year it was observed in much larger numbers on infested trees in the experimental orchard and also in an infested orchard near by. It was much more abundant in the latter, probably on account of the much larger number of scale insects, since practically nothing had been done to keep the pests in check. This beneficial form was not present in sufficient numbers to attract notice till Sep. 25, and from then till the middle of October, at least, the beetles were quite numerous; 50 on a small badly infested tree would not be an excessive estimate. These ladybugs, however, do not seem to have made much impression as yet on the San José scale; and, though they were much more abundant in the adjacent orchard where no insecticides of any account had been applied, the scale had not been affected enough to warrant a hope that eventually this pest may be controlled by this little natural enemy. It certainly would not be wise at present to defer treatment with insecticides on account of the presence of this tiny ladybug.

The fruit tree bark beetle, *Scolytus rugulosus* Ratz., also occurs in the experimental orchard, attacking a number of trees last year but injuring only one very seriously. This was broken down by wind or other agency, and the beetles entered the prostrate limbs in large numbers. This year a light oxheart cherry (tree 4) was attacked by this beetle and injured considerably. It was in excellent condition last year, but toward the end of the season became rather badly infested with San José scale. July 3 it was found to be infested with *Scolytus*. There was a copious exudation of sap or gum and a number of edematous swellings were observed here and there. The tree was quite badly affected Aug. 9. Several other trees were attacked to a less extent by this borer.

Appearance of oil on trees. This general note applies to all trees treated with crude petroleum or mechanical emulsions of the same. May 22, the oil shows very plainly, and all of the

¹N. Y. state ent. 16th rep't. 1901. p. 970.

trees appear to have been in a very good condition, except where dead twigs are recorded in the following notes, and this is more likely due to injury by the San José scale or winterkilling from some other cause, than from the application of insecticides, either this or the previous year; since it is about as common on trees treated with whale oil soap as on those sprayed with crude petroleum.

Standard oil, 20% mechanical emulsion. 11 trees were treated with this combination. They are as follows: tree 115 a Bartlett and trees 24, 110 and 111, Kieffer pear; tree 25, a beurre bosc; trees 70 and 71, respectively Clapp's favorite and beurre d'Anjou pears; trees 43, 44, 88 and 89, old Mixon peach. The condition of these trees was as follows toward the close of the growing season, Sep. 7, 1900. There were very few or no young scale insects on trees 24 and 115; no living young were found at that time on tree 111, very few on tree 110, but few on trees 25, 43 and 44; living young were very abundant on trees 70, 71 and 88, specially on tree 71, and they were extremely abundant on tree 89.

The first observations, made after the spraying of Ap. 11, were on May 22, when only those trees presenting something out of the ordinary received special attention. Tree 71 had then only one vigorous shoot, and tree 88 had been cut down to a five foot stump, from which a few buds were breaking forth.

July 3, a date which was late enough to permit a fair judgment of the numbers of living scale insects, through the abundance of the young, the conditions were as follows. There were few or no young on trees 24, 25, 43, 88, 110, 111 and 115; young were rather few on tree 44 and few on trees 70, 71 and 89. The following additional notes were made at this time regarding the condition of certain of the trees. The new shoots on tree 25 were vigorous, and the cluster of shoots on tree 88 were short and vigorous. The bark of tree 70 was very rough.

Aug. 9 very few or no young scale insects were to be found on any of these trees. The shoots on tree 88 were growing very fast.

Sep. 25, there were very few or no young scale insects on trees 24, 25, 71, 88, 89, 110 and 111; and young were relatively few on trees 70 and 115.

The above record, it will be observed, shows that with only one application in a year, the San José scale was kept in control in a very satisfactory manner, with the exception, perhaps, of trees 70 and 115. The former was very badly infested in the spring of 1900, and, while the treatment with whale oil soap controlled the pest to a great extent, living young were very abundant on it in September 1900. Its bark was very rough, and this with the old scales would serve as a considerable protection to the young, and it is not surprising that some survived the spraying of 1901. It is by far the worst tree in this lot. Tree 115 is exceptional in that it was located on the edge of an old orchard, where it could become infested from neighboring trees.

Standard oil, 25% mechanical emulsion. 7 trees were treated with this mixture. They are as follows: tree 21, a Howell, and tree 106, a Vermont beauty pear; trees 38, 83 and 84, globe peach; tree 40, a Crawford and tree 85, an old Mixon peach. The condition of these trees toward the close of the growing season, Sep. 7, 1900, was as follows. Young scale insects were very few on trees 83 and 84, few on trees 85 and 106, abundant on tree 21, very abundant on tree 38, and exceedingly so on tree 40. Trees 39, 66, 67 and 107 also belonged in the area treated with this mixture, but all of them were cut back to mere stumps in 1900, and they were removed in the spring of 1901.

May 22 the following notes were made on trees presenting an appearance out of the ordinary. There were only a few small limbs alive on tree 40, and a number of small limbs had been winterkilled on tree 83. Tree 106 was thickly set with fruit.

July 3, the following conditions were apparent. There were very few or no young scale insects on trees 38, 40, 83, 84 and 106; they were few on tree 21, and rather abundant on tree 85. It was noted that the bark was quite rough on trees 21 and 66, which undoubtedly explains why young scale insects were present on these trees, as it is practically impossible to kill all the

individuals with a spray when the bark offers numerous sheltering crevices.

Aug. 9 there were few or no young scale insects on trees 38, 40, 83, 85 and 106, few on trees 21 and 84, and rather few on tree 66.

Sep. 25, the following conditions prevailed. There were very few or no living scale insects on trees 83 and 106, very few on trees 84 and 85, few on trees 38 and 40. Young scale insects were rather abundant on some twigs of tree 21, but its general condition was very good considering its previous history.

This record is apparently not so satisfactory as in the case of the smaller per cent of oil. Allowance should be made in the case of trees 21, 38 and 40. The first was in exceedingly bad shape in the spring of 1900, and, while spraying with undiluted kerosene killed many of the scales, so many were left that the tree was abundantly infested the following September. The scraggy, rough condition of the tree, in my opinion, amply accounts for the failure to kill all the scale insects last spring. Trees 38 and 40 were sprayed with 20% kerosene in 1900, and the abundant scales on them in the spring of 1901, together with the very rough bark of tree 38, would afford ample shelters for the escape of a few. The very few living scales found on trees 84 and 85 in September 1901 could easily have been brought from adjacent trees, though one or two individuals may have escaped the spray.

Titusville oil, 20% mechanical emulsion. There were 14 trees treated with this mixture. They are as follows: trees 26 and 27, Kieffer; trees 28 and 114, seckel; tree 72, Flemish beauty; tree 73, Howell; tree 74, beurre bosc; trees 112 and 113, beurre d'Anjou pears; trees 45, 47, 90 and 91, old Mixon peach; and tree 46 a champion quince. Their condition near the end of the growing season, Sep. 7, 1900, was as follows. There were few or no young scale insects on trees 26, 27, 112, 113, few on trees 45, 46, 74 and 114; they were rather abundant on trees 47 and 73, abundant on tree 28, and very abundant on trees 90 and 91.

The first examination after spraying occurred May 22, and only those trees presenting something out of the ordinary were

noted. Many small limbs were dead, probably winterkilled, on trees 47, 90 and 114. A large dead limb had been cut off of tree 45, the tops of trees 47 and 90 were thin, and all that remained of tree 72 was a stub with vigorous suckers.

July 3, the following conditions were noted. There were very few or no young scale insects on trees 26, 27, 46, 47, 72, 90 and 113; very few young were found on trees 74, 112 and 114; few young were found on tree 28; young were rather abundant on tree 45, and abundant on tree 73. At this time the sprouts on tree 72 were growing slowly.

Aug. 9, the conditions were as follows. There were very few or no young on trees 26, 27, 45, 46, 47, 74, 90, 91, 112, 113 and 114; young were rather abundant on tree 28, and abundant on tree 73. Tree 72 was represented only by a stub at this time.

Sep. 25, the following conditions prevailed. There were few or no living scale insects on trees 26, 27, 46, 47, 91 and 113; there were very few on tree 28; few on trees 45, 72 and 90; relatively few on trees 74, 112 and 114; and they were very abundant on tree 73.

The condition of this lot of trees Sep. 25 was fairly satisfactory if we except tree 73, and the occurrence of abundant young on this can be explained only by the probability of a number of insects being so sheltered by the very rough bark that the spring application of petroleum did not reach them. The presence of a few scale insects at the end of the season on trees 45, 72 and 90 is not surprising, considering that they could have easily become infested from other trees, even if all the living scale insects on them at the time of the treatment had been killed by the petroleum. The occurrence of more living scales on trees 74, 112 and 114, all of them located on the extreme edges of the orchard and in positions where they would be most likely to have the pest carried to them by birds and other insects, gives additional weight to the opinion that the results produced by the various insecticides have been modified during the growing season by the conveying of crawling young scale insects to the trees by various natural agents. A very

good proportion of the trees in this lot are practically free from San José scale.

Titusville oil, 25% mechanical emulsion. There were 10 trees treated with this mixture. They are as follows: trees 22, 23 and 69, Howell; tree 68, a Vermont beauty; tree 108, a Bartlett; tree 109, a beurre bosc pear; trees 41 and 86, Crawford; and trees 42 and 87, old Mixon peach. Their condition near the end of the growing season, Sep. 7, 1900, was as follows. There were very few or no young scale insects on tree 86; few on trees 42 and 109; they were rather abundant on trees 41 and 87; abundant on trees 22, 23, 69 and 108, and exceedingly abundant on tree 68.

May 22, there were only a few upper limbs living on trees 86 and 87.

July 3, there were very few or no young scale insects on trees 41, 42, 86, 87 and 109; there were few on trees 22 and 69; they were rather abundant on tree 23, and abundant on trees 68 and 108.

Aug. 9, there were very few or no young on trees 41, 42, 87 and 109; and they were rather abundant on trees 23, 68, 69 and 108. Tree 86 was dead.

Sep. 25, there were very few or no young on trees 69, 87 and 109, few on trees 41 and 42, rather few on trees 23 and 108; and they were rather abundant on trees 22 and 68. Tree 87 was then a mere stump.

A study of the above record in connection with the diagram of the orchard shows that, of the six trees on which living San José scales were found Sep. 25, three were on the extreme edges of the orchard and therefore very liable to become reinfested during the season. In addition, it should be noted that two of these three trees, nos. 22 and 23, were very badly infested in the spring of 1900, and in the fall of that year living scale insects were abundant on them. The bark on these trees was also very rough. Of the other three, there were only a few living scales on trees 41 and 42, and the remaining interior tree, no. 68, which has a very rough bark, was very badly

infested in the spring of 1900 and abundantly so the following autumn. This is certainly not a very bad showing for this oil.

Crude petroleum, undiluted Titusville oil. The disastrous results obtained with this substance last year acted as a check to more extensive experiments this season. It was decided to test in a small way some of the crude petroleum received from Titusville Pa. because, according to certain published accounts, it would not harm the trees. A description of its physical properties is given on p. 762. Three trees were sprayed with this substance. Tree 20, a Bartlett pear, was very badly infested with the scale in 1900, and it was selected among others, for treatment that spring with undiluted kerosene. It was in a very bad state to begin with, and last October even the suckers from this tree appeared to be in an unhealthy condition. It was sprayed Ap. 11, 1901, with this crude petroleum. It developed no leaves the present season, and it was probably nearly dead before the petroleum was applied. Tree 116 was a Lombard plum which was very badly infested with the San José scale, but, as the infestation was comparatively recent, and as the tree had received no previous application of an insecticide, it was a very good subject to experiment on. The oil was sprayed on the tree rather liberally Ap. 11, and July 3 it was seen that several limbs were seriously injured and dying, and that some of the others gave indications of feebleness. Aug. 9, this tree was dead, the result, undoubtedly, of the application of the oil. Less oil would probably have been less injurious, but the fact remains that this so called safe oil is not necessarily so. The third tree was Crawford peach, which was very badly infested with San José scale, and, like the preceding, it had not been treated with any insecticide. The scales were so abundant as literally to cover most of the trunk and the larger limbs, and in some places they appeared to be two or three deep. This tree developed no leaves, and it was probably very seriously injured by the scale infestation. Its death can hardly be attributed to the application of the oil.

Good's whale oil soap no. 3 and 10% petroleum. The Standard oil was used in these experiments. There were 12 trees treated

with this compound. They are as follows: trees 18 and 63 are an early unnamed pear; trees 19, 64, 65, 104 and 105 are Bartletts; tree 103 is an Idaho pear; trees 36, 37, 81 and 82 are globe peach. The condition of these trees near the end of the growing season, Sep. 7, 1900, was as follows: there were very few or no young scale insects on trees 18, 19, 82 and 104, very few on trees 63, 81 and 105, few on tree 103; they were abundant on tree 36, and very abundant on trees 37, 64 and 65.

May 22 it was seen that many of the tips of the smaller limbs on tree 37 had been winterkilled, and that tree 82 had suffered in this way to some extent.

July 3, there were very few or no young scale insects on trees 36, 81, 82, 103, 104 and 105, few on trees 18, 19, 37, 63 and 65; and they were rather abundant on tree 64, which has a rough bark.

Aug. 9, there were few or no young on trees 18, 36, 37, 63, 81, 82, 103 and 104, few on trees 19, 64 and 105, and they were rather few on tree 65.

Sep. 25, there were very few or no living scale insects on trees 63, 64, 65, 81, 104 and 105, very few on trees 18, 19 and 103, and but few on trees 36, 37 and 82.

The record for this substance is very good. Three of the trees having very few living scale insects on them at the end of the season were on the edges of the experimental orchard, where they could easily have become reinfested. Living scale insects were abundant and very abundant, respectively, on trees 36 and 37, while tree 82 was very badly infested in the spring of 1900, and, though very few were found on it at the end of that season, some might easily have escaped the second treatment under the shelter of old scales.

Good's whale oil soap no. 3 and 15¢ petroleum. The Standard oil was used in these experiments. This combination was tested on 13 trees. They are as follows. Trees 15, 16, 60, 61 and 101 are seckel; trees 17 and 62, an early unnamed variety, and tree 102, a beurre bosc pear. Trees 34, 35, 79 and 80 are globe peach trees; tree 34a, a natural sprout. Their condition near the end

of the growing season, Sep. 7, 1900, was as follows. There were very few or no young insects on trees 60, 61, 79, 101 and 102, very few on tree 80, few on trees 16, 17 and 62; they were rather abundant on trees 34, 35, and numerous on tree 15.

May 22, very few limbs were winterkilled on trees 34, 35 and 80, and there were a number of dead limbs on tree 101.

July 6, there were very few or no young scale insects on trees 34, 34a, 62, 80, 101 and 102, very few on trees 17, 35, and 79, few on trees 16 and 60; they were rather abundant on tree 15, and abundant on tree 61. The bark of tree 61 was very rough, and the sprouts on tree 101 were rather thrifty.

Aug. 9, there were few or no young on trees 17, 34, 34a, 35, 60, 62, 79, 80, 101 and 102; they were rather abundant on trees 15, 16 and 61.

Sep. 25, there were few or no living scale insects on trees 34, 62 and 101, very few on trees 15, 16, 17 and 102, few on trees 34a, 35, 60, 79 and 80; they were rather abundant on tree 61.

The general condition of this lot of trees Sep. 25, 1901, is very fair. Living insects were found on three quarters of the total number, but not in considerable numbers, except in the case of tree 61, which was very badly infested in the spring of 1900, and its rough bark undoubtedly accounts to a large extent for the poor success in controlling the pest in this instance. The very few on trees 15, 16, 17 and 102 might easily have been carried to them by natural agents, since they are on the edge of the orchard near adjacent, untreated trees. In the case of the remaining infested trees, nos. 35, 60, 79 and 80, while they may have been reinfested, it is very probable that in each instance a few insects escaped the spray.

Good's whale oil soap, no. 3, 1½ pounds to the gallon. This strength was used on 24 trees. They are as follows. Tree 3 is a light exheart, tree 4, a wild cherry, and tree 4a, a plum 5 feet high. Tree 6 is a Crataegus. Tree 75 is a Crawford, and tree 29 is a globe peach. Trees 7, 9, 51, 52, 53 and 92 are botan; tree 8 is a Lombard; tree 49, an abundance, and tree 95, a golden drop plum. Tree 54 is a nectarine. Trees 10 and 55 are beurre

bosc; trees 11, 56 and 57 are seckel; tree 50, an Idaho, and tree 96 a beurre d'Anjou pear. Tree 48 is a crab apple. The condition of these trees near the close of the growing season, Sep. 7, 1900, was as follows. There were very few or no living scale-insects on trees 5, 6, 29, 48, 49, 55 and 56, very few on trees 75 and 97, few on trees 7, 30 and 96; they were very abundant on trees 3 and 50 to 53, and extremely abundant on trees 8 to 11.

May 22, tree 5 was just beginning to bloom, though it had been partly uprooted by the wind. Trees 9 and 10 had set considerable fruit. Trees 52 and 53 were winterkilled to some extent, and the same was true of tree 92. Trees 93 and 94 had died from the applications of the previous year, and had been removed.

July 6, there were very few or no young scale insects on trees 4a, 7, 7a, 11, 29, 30, 48, 55, 75, 96 and 97, few on trees 51 and 56; they were rather abundant on trees 4, 9, 10, 52, 53, 92 and 95, and very abundant on trees 8 and 50. There was considerable dead wood on trees 52, 53 and 92, and the bark was rather rough, affording admirable shelters for scale insects. Tree 8 was very badly infested in the spring, and the bark was quite rough. The same was practically true of tree 10. Tree 4 had been attacked by *Scolytus rugulosus* Ratz., and the sap was exuding copiously.

Aug. 9, there were very few or no living young scale insects on trees 6, 7, 29, 30, 48, 55, 56, 96 and 97, few on trees 4, 4a, 7a and 9, trees 8, 49, 51, 52, 53 and 92, abundant on tree 95, and very abundant on tree 50. Tree 5 had been removed, it probably dying as a result of being partly uprooted.

Sep. 25, there were few or no living scales on trees 6, 55, 56, 96 and 97, few on trees 10, 29, 30, 48, 54, 55 and 75, rather few on trees 4a, 49 and 51; they were rather abundant on trees 4, 7, 7a, 9, 11, 52 and 95, and very abundant on trees 8 and 50. Tree 75 was broken down to the trunk by a heavy crop of fruit, but the semiprostrate limbs showed no evidence of having been attacked by *Scolytus rugulosus* Ratz. There was a large amount of dead wood on tree 92, and many vigorous shoots. *Scolytus* was working in the dead wood and also attacking the living to some extent.

The record is about on a par with that of the stronger solution of whale oil soap. The scale has been held in check in most instances, but there is no approach to exterminative work, such as is effected by the mechanical emulsions of crude petroleum. There are comparatively few extenuating circumstances, since only five trees in this large lot were abundantly infested with the scale in the fall of 1900, and, as this condition was due to recent development, the bark of these trees was hardly rough enough to insure much protection to the scales.

Good's whale oil soap no. 3, 2 pounds to the gallon. This solution was tried on 15 trees. They are as follows. Trees 12-14, 57-59 and 98-100 are seckel pear; trees 31-33 and 76-78 are globe peach. Their condition about the close of the growing season, Sep. 7, 1900, was as follows. There were very few or no young scale insects on trees 57 and 78, very few on trees 76, 77 and 98, few on trees 31, 99 and 100; they were rather abundant on trees 58 and 59, abundant on trees 32 and 33, and extremely abundant on trees 12-14.

May 22, tree 100 had set considerable fruit; trees 31, 32 and 77 were injured somewhat by winterkilling, the tips of many of the smaller limbs being dead; tree 76 was also badly affected in this manner.

July 6, there were very few or no young scale insects on trees 31, 32, 57, 76, 77, 78, 98 and 100, few on trees 33, 59 and 99, and rather few on tree 58; they were rather abundant on tree 14, abundant on tree 12, and very abundant on tree 13. The bark of both trees 58 and 59 is quite rough.

Aug. 9, there are very few or no young on trees 31, 32, 33, 57, 76, 77, 78, 98 and 100, and few on tree 59; they were rather abundant on trees 13, 14, 58 and 99, and abundant on tree 12.

Sep. 25, there were few or no living scale insects on trees 57, 98 and 100, few on trees 76 and 78; they were rather abundant on trees 31, 32, 33, 58, 59 and 99, abundant on trees 13, 14 and 77, and very abundant on tree 12.

The record given above is not very bright, particularly when we remember that in this lot there were no very badly infested

trees till the autumn of 1900, when trees 12, 13 and 14 were very badly infested; and, on account of this close proximity to trees in a similar condition on which the scale bred unchecked during the entire season of 1900, it is very probable that they became reinfested during the growing season, and therefore their condition Sep. 25, 1901, should not be taken into account when judging of the merits of whale oil soap; and the same would be true, but to a less extent, of trees 31-33. Even after throwing these trees out of consideration, the results are not equal to those obtained with mechanical petroleum emulsions, though the pest was well controlled.

Summary of experiments

A study of the above records will show that the best results have been obtained with either a 20% or a 25% mechanical emulsion of crude petroleum. Apparently somewhat better results were obtained by the use of the oil purchased from the Standard oil co., but this may be partly accidental. It is a trifle early to be positive regarding this point. It is certain, however, that either the Standard oil or the crude petroleum obtained from the Frank oil co., Titusville Pa., will give very satisfactory results. The whale oil soap and crude petroleum combinations were very effective, but were not so valuable as insecticides as mechanical petroleum emulsions. None of these preparations injured the trees in the slightest degree.

The experiments with the whale oil soap solutions show that, while this substance is valuable as a check, it can hardly be relied on when applied in early spring to do anywhere near so thorough work as the crude petroleum emulsions. The reason for the greater efficiency of the crude petroleum is probably found in the greater penetrative action of the oil. The few tests with the undiluted crude petroleum confirm the experience of the previous year and lead us to conclude that it is a very unsafe substance to apply to trees.

VOLUNTARY ENTOMOLOGIC SERVICE OF NEW YORK
STATE

The work of the last two years has been continued, and a large number of observations have been added to previous records. 39 voluntary observers were appointed during the season, and 35 of them have rendered more or less detailed reports. The summaries of these reports, representing as they do, the entomologic conditions in 33 counties, are given below.

Very naturally, owing to the great destructiveness of the forest tent-caterpillar, *Clisiocampa disstria*, and its close ally, the appletree tent-caterpillar, *Clisiocampa americana*, many of the reports dwell much on these two insects. The Hessian fly, *Cecidomyia destructor*, has also received considerable attention at the hands of the voluntary observers.

Summaries of reports from voluntary observers

The scientific names or other matter inserted in brackets indicate determinations or information supplied by the entomologist. The other names are presumably correct, except where questioned. The dates given after the records are those of the reception of the reports, and they are usually from one to three days later than the writing of the report.

Albany county (E. T. Schoonmaker, Cedar Hill)—Forest tent-caterpillars [*Clisiocampa disstria*] are hatching out in large numbers, and the prospects are that they will be more numerous than last year. Ap. 30. They are eating in the center of the leaf buds and thus making their control exceptionally difficult, though the cold weather of the past week has caused them to remain comparatively inactive up to this date. May 5. Elm leaf beetles [*Galerucella luteola*] have appeared in limited numbers, though many still remain in buildings. The forest tent-caterpillars are quite abundant on maples, and their ravages are now quite noticeable. Heavy rains have checked their ravages to some extent, but conditions are not favorable for their wholesale destruction. May 21. Striped cucumber beetles [*Diabrotica vittata*], squash bugs

[*Anasa tristis*] and crickets are rather few. Young grasshoppers are numerous and are appearing on potatoes and other garden crops. Potato beetles [*Doryphora 10-lineata*] are very numerous and destructive. Elm leaf beetle grubs are more numerous than last year and are growing very rapidly. Tent-caterpillars have spun their cocoons. The recent rains have caused the disappearance of plant lice on rosebushes and trees. July 9. Elm leaf beetles are now in the pupa stage, and their ravages are equal to those of last year. Striped blister beetles [*Epicauta vittata*] are exceptionally numerous defoliating many potato patches. A thorough spraying with a strong solution of arsenate of lead has proved very satisfactory. Grasshoppers are more abundant than last year, and quail are devouring them in large quantities. Squash bugs are very numerous and destructive, and many melon patches have been ruined by their ravages. Cabbage butterflies [*Pieris rapae*] have appeared in small numbers. Spotted grapevine beetles are numerous, and they are doing much damage to grape leaves. Codling moth injury is as great as in former years. July 30.

Chemung county (M. H. Beckwith, Elmira)—[*Lecanium cerasifex*] is quite abundant on an apple tree in my orchard. Mar. 26. Apple tree tent-caterpillars [*Clisiocampa americana*] appeared for the first time Ap. 29. They are much more abundant than last season. May 13. Currant worms [*Pteronous ribesii*] appeared on gooseberries on May 31, and the first potato beetle [*Doryphora 10-lineata*] was seen May 21. May beetles [*Lachnosterna*] are very abundant. May 23. Injury by Hessian fly [*Cecidomyia destructor*] is very evident in several fields of wheat which I examined today. Probably 10% of the stalks have fallen down on account of the work of the fly. June 29.

Dutchess county (W. F. Taber, Poughkeepsie)—Apple tree tent-caterpillars [*Clisiocampa americana*] are very abundant in many orchards and will probably do much damage if they are not looked after. Heavy rains and cool weather have kept insects in check. May 21.

(H. D. Lewis, Annandale)—The egg masses of both the forest and appletree tent-caterpillars [*Clisiocampa americana*, *C. distria*] are very numerous, and the indications are that these pests will be very destructive. Appletree bark lice [*Mytilaspis pomorum*] and scuffy bark lice [*Chionaspis furfura*] are very abundant in this section. Ap. 13. Tent-caterpillars appeared in large quantities from Ap. 25 to May 1, and the forest tent-caterpillars were very numerous about a week later. Both species will be fully as abundant as last year, though the cool wet weather has held them somewhat in check. May 18. Forest tent-caterpillars are more abundant than ever before. Some orchard and shade trees are being completely defoliated by them. The common appletree tent-caterpillar, though numerous, does not appear to be so abundant as last year. The rains have been so frequent that it has been very difficult to keep insecticides on the trees, and consequently these pests are not controlled even by the most careful growers. May 24. There are large numbers of tent-caterpillars of both species. Cutworms are very numerous, and there are some plant lice of different species. The continuous rains have made it very difficult to keep the immense numbers of forest tent-caterpillars under control. June 1. Potato beetles [*Doryphora 10-lineata*] are just appearing in considerable numbers. Tent-caterpillars are beginning to spin their cocoons, after having caused more injury than ever before. I have noticed robins picking open the cocoons and devouring their contents. Striped squash beetles [*Diabrotica vittata*] are quite abundant. Injury by the plum curculio [*Conotrachelus nenuphar*] is apparently much less than for many years. June 17. Fall webworms [*Hyphantria cunea*] are just making their appearance. Potato beetles are more abundant than they have been for years. June 29. Trees that were defoliated by tent-caterpillars have developed new foliage. Many of the cocoons of the forest tent-caterpillar appear dead and shriveled, but no moths have been seen in this vicinity. July 19. Red-humped appletree worms

[*Schizura concinna*] are present in small numbers and confined to two or three orchards. The eggs of the appletree tent-caterpillar occur in large numbers, but I fail to find any of the forest tent-caterpillar. Aug. 12. A small webworm, *Cacoecia* species, is doing a great deal of damage to maples. Aug. 20.

Erie county (M. F. Adams, Buffalo)—Mourning cloak butterflies [*Evanessa antiopa*] were flying Ap. 11, and red admirals [*Vanessa atalanta*] were flying the 13th. The egg masses of the white marked tussock moth [*Notolophus leucostigma*] are abundant in many localities, and their ravages will probably equal those of 1895. May 10. The young grubs of the willow snout beetle [*Cryptorhynchus lapathi*] were found abundant in Carolina poplars just beneath the bark. The mines are irregular, winding and extend upward. *Goes pulchra* is destroying young hickory. May 21. May 19, *Saperda fayi* had pupated. May 20 the males of the Putnam scale [*Aspidiotus ancyclus*] were emerging. The euonymus scale [*Chionaspis euonymi*] is quite injurious in this section. May 25. Carpenter worms [*Prionoxystus robiniae*] were found in the larva and pupa stages in the ash, and to all appearances those which were to emerge this year had already pupated. May 29. June 5 I took adults of *Podosesia syringae* ovipositing in *Fraxinus excelsior* and on the same date adults of *Neoclytus erythrocephalus* were emerging from a dead tree of the same species. The appearances indicate that there will be an unusually large number of the locust borers this season. June 7. Observation in the near vicinity of Buffalo shows that from 6% to 8% of the wheat has been destroyed by Hessian fly [*Cecidomyia destructor*]. June 11. *Graphisurus fasciatus*, *Xyloterus colonus* and *Typocerus zebratus* have been emerging from *Quercus rubra*, the first on the 18th and the latter two June 14. *Saperda fayi* also emerged on the latter date from various species of *Crataegus*. The willow snout beetle was ovipositing on cotton

woods June 16. Moths of the carpenter worm emerged from ash and poplar June 14. June 19. The cool weather of the spring has apparently kept the white marked tussock moth in check, as the caterpillars are now not over $\frac{1}{4}$ of an inch in length, while last year on this date many of them were full grown and had commenced to spin their cocoons. June 28. July 4 white marked tussock moth caterpillars were spinning their cocoons in the down town districts. A few have been destroyed by a bacterial disease. July 5. June 28 the last locust borer moth emerged from the the wood. July 17 the female white marked tussock moths were depositing their eggs, and on the same date I obtained examples of the willow snout beetle from the balm of Gilead in the adult larval and pupal stages. The 15 spotted ladybug [*Hippodamia 15-punctata*] has been exceptionally abundant this season and has proved itself a valuable ally in destroying plant lice. The white marked tussock moth has been quite injurious in many localities in the city, and in some places it was as destructive as in 1895 or in 1898. Parasites appear to be rather scarce. The willow snout beetle is still causing a great deal of injury to poplars and willows in this vicinity. I have taken it from the following varieties: balsam poplar, balm of Gilead, Carolina poplar, Lombardy poplar, Babylonian willow, heart-leaved willow, Kilmarnock willow and from the trunk of the new American weeping willow. I have never taken it from the golden-barked willow, laurel-leaved willow, the silver poplar, the bollean poplar, though a great many of these varieties are growing in the vicinity of the infested trees. July 26.

(J. U. Metz, East Amherst)—The common asparagus beetle [*Crioceris asparagi*] has appeared for the first time this year. May 20. Hessian fly [*Cecidomyia destructor*] is present in great abundance, and many fields of white wheat are not worth cutting. I have counted as many as 20 "flaxseeds" in a single stalk. There is apparently no difference between early or late sown wheat. Red Russian and red Mediterranean seem to be exempt thus far from attack. A few

appletree tent-caterpillars [*Clisiocampa americana*] are seen on wild cherry. July 2. The work of the Hessian fly is becoming more apparent as harvest time approaches, and nearly every stem of wheat is infested. I have an idea that the wheat will yield better than some people surmise at present. I have just been examining my asparagus and have been unable to find any beetles or slugs. Plum curculios [*Conotrachelus nenuphar*] seem to be worse than usual this year. White grubs or something of that nature must be working in my sheep pasture, as much of the grass is pulled up by the sheep. It seems to be cut off below the surface of the ground by some insect. July 16. Grasshoppers are now very numerous, and my crop of celery for home use has been destroyed by them. July 20.

Fulton county (Cyrus Crosby, Cranberry Creek)—Appletree tent-caterpillars [*Clisiocampa americana*] do not appear to be very abundant, as I have seen but one nest on an appletree so far this year. Appletrees in this vicinity are nearly all badly infested with the appletree bark louse [*Mytilaspis pomorum*]. May 8. The cold damp weather has checked the development of insects very much. The nests of the appletree tent-caterpillars are beginning to show up, but they are by no means as thick as they were in Yates county last year. May 17. I find little beetles [*Typophorus canellus*, a strawberry root worm] on elms. They were very common two weeks ago. June 6. There are a few appletree tent-caterpillars near Mayfield, but elsewhere I have seen none. Only one forest tent-caterpillar [*Clisiocampa distria*] was found. Horn flies [*Haematobia serrata*] are very troublesome to cattle. June 22.

Genesee county (J. F. Rose, South Byron)—Appletree tent-caterpillars' eggs [*Clisiocampa americana*] began hatching about Ap. 25, and they are now very numerous. One cold day I climbed into a tree for the purpose of crushing the caterpillars in a nest. It was an ideal day for them to be at home, but I found they were scattered for a distance of 2 feet

or more from the nests and were destroying the leaves at a rapid rate. May 10. Colorado potato beetles [*Doryphora 10-lineata*] are now seen in numbers in gardens, and, as potatoes are not up, the beetles are working on transplanted tomatoes. Early sown turnips and cabbages suffer severely from the cabbage maggot [*Phorbia brassicae*]. Canker worms are doing great damage in orchards where they were numerous last season. The roadside shrubbery is about defoliated by apple-tree tent-caterpillars. The sugar maple borer [*Plagionotus speciosus*] is doing considerable damage in this vicinity. Its work in various trees shows first in dead limbs 40 to 60 feet from the ground, and this renders its control practically impossible. The red wheat, where that has been sown, has suffered very little injury, perhaps 5% to 20%. June 11. A large crop of what early promised to be good wheat will not be worth cutting on account of the Hessian fly [*Cecidomyia destructor*] injury. Some farmers are plowing up their injured wheat fields and sowing them with other crops, though many will not, as they are anxious to save the seed. Many full grown tent-caterpillars were crawling about the streets June 1 looking for places to spin up. Potato beetles, asparagus beetles [*Crioceris asparagi*] and striped cucumber beetles [*Diabrotica vittata*] are present in usual numbers. Currant worms [*Pteronous ribesii*] are scarce. June 6. I am unable to learn of any white wheat that is not badly injured by the Hessian fly. The red wheat has not been injured to any extent as yet. June beetles have been exceptionally scarce, and cutworms are more than usually abundant. The cabbage maggot has never been so injurious. It took one fourth to one third of 200 early cabbages. Colorado potato beetles are exceptionally abundant on early potatoes. On vines 6 to 8 inches high, which were sprayed with bordeaux mixture and arsenoid, the beetles were pretty thick, and examination showed that they had been cutting off the leaves and eating into the stems of the plants. Both sweet and sour cherries have been nearly ruined by the

cherry aphid [*Myzus cerasi*] and the new growth of plums and prunes is a solid mass of grayish green plant lice. Reports are coming in that some insect [? *Phorbia fusciceps*] is seriously injuring beans. June 25. Very little, if any, white wheat will be harvested in this section. 90% of all that is grown in this section is a white wheat known as no. 6. It has been exclusively grown for some years and is a fine yielder. The prospect early in the season was that there would be 20 to 35 bushels to the acre in all fields, as there was little winter injury. A field of white wheat near here, belonging to G. G. Chick, was not sown till the first week in October and looked well much later in May than that early sown, but today he informs me that there will be no wheat. July 2. An eight acre field of white beans, which had been sown on a field of ruined wheat, was found to be seriously infested with some insect. The beans at the time of the examination were 3 to 4 inches high, and there were long spaces in the rows where no plants could be seen at all, and in many other places there were only bare stems with no signs of leaves. [This injury was subsequently identified as probably the work of a small fly, *Phorbia fusciceps*]. The Hessian fly has also attacked rye, timothy and barley. A perfectly reliable farmer has told me that he has found as many as 50 of the fly maggots in a stalk of barley. One of our large farmers is now cutting his barley and curing it for hay, it is so badly affected. I saw yesterday in Leroy some wheat which is known as Golden chaff or Clausen's Golden chaff. It is a white wheat which appears to be but little troubled by the fly, no more than the red wheat about here. July 9. The pale striped flea beetle [*Systema taeniata*] is quite abundant in some bean fields. July 15. Fall webworms [*Hyphantria cunea*] appeared for the first time last week. The common squash bug [*Anasa tristis*] is the worst I have ever known it to be. July 27. Tonight a lot of bean plants that have been eaten off or nearly so, so that they fall over and wilt, were brought to me with the statement that the trouble occurred in a number of fields.

No sign of insect injury was observed in the field. The beans are now about 6 inches in height, and many of them have buds 3 or 4 inches long. [The trouble was referred to the work of a small fly *Phorbia fusciceps*]. Aug. 2.

Greene county (O. Q. Flint, Athens)—It is the impression in the western part of the county that the forest tent-caterpillar [*Clisiocampa disstria*] will be much less abundant than in previous years. Ap. 25. Both the forest tent-caterpillar and the appletree tent-caterpillar [*Clisiocampa americana*] have hatched, and are much more numerous than heretofore in the eastern part of the county, though not so abundant in the western part as when they first appeared in destructive numbers. The forest tent-caterpillars have been exceptionally injurious in the eastern and east-central parts of the county, defoliating appletrees in particular. The same is true in the western portion of Columbia county. The numbers of this pest are much decreased in the western part of Greene county and in Otsego county. The continuous wet weather appears to have retarded the development of the tent-caterpillars. June 5. The forest tent-caterpillars appear to have done the greatest injury, when present in a locality, in orchards, but they have been comparatively harmless in the forests. June 14.

Herkimer county (George S. Graves, Newport)—The appletree bark louse [*Mytilaspis pomorum*] was exceedingly abundant on Pennsylvania maples in this vicinity. Feb. 11. The first appletree tent-caterpillars [*Clisiocampa americana*] were observed Ap. 26 in one place and in another May 4. No forest tent-caterpillars [*Clisiocampa disstria*] have been observed as yet. May 10. The cigar case-bearer [*Coleophora fletcherella*] is present on appletrees in large numbers and is doing considerable damage to the buds and maples. The nests of the appletree tent-caterpillar are not as plentiful as last year in this locality. Five appletrees here have been practically ruined by the appletree bark louse. The cold weather appears to have delayed the hatching of tent-caterpillar eggs. May 16. A few clusters of the forest tent-caterpillar have

been observed in this locality, but they are comparatively very rare. Currant worms [*Pteron us ribesii*] have appeared on currant bushes. The currant aphid [*Myzus ribis*] is not very abundant. May 21. Tent-caterpillars are comparatively scarce thus far. A few forest tent-caterpillars were noticed in Poland 4 miles away. The appletree bark louse has also proved quite injurious to cultivated mountain ash and *Crataegus* in a yard. One orchard near a forest undergrowth is about equally infested with the appletree and forest tent-caterpillars. The cold seems to have kept the tent-caterpillars in check, but plant lice are very numerous and injurious. May 31. Colorado potato beetles [*Doryphora 10-lineata*] first appeared in considerable numbers May 26. Tent-caterpillars are relatively very scarce. The prolonged rainy weather seems to have kept some insects in check severely, though currant worms are plentiful and quite injurious. June 6. Cabbage butterflies [*Pieris rapae*] were noticed June 13, and on the 18th rose beetles were quite abundant. The onion thrips [*Thrips tabaci*] is working on our lettuce. The first grubs of the Colorado potato beetle were seen June 13. Grasshoppers seem to be more plentiful than last year and currant worms are unusually abundant. Not a cocoon of either tent-caterpillar has been observed. June 19. Squash bugs were first observed on the vines June 16. Grasshoppers are very plentiful, but so far no particular injury has been done by them. Potato beetles are unusually numerous. Rose beetles [*Macrodactylus subspinosus*] are attacking the appletrees and rapidly devouring the small apples. June 27. Rose beetles have now disappeared, and it does not seem as if they had caused much injury. Grasshoppers are reported very numerous in the valleys but not on the hills. The spinach flea beetle [*Disonycha collaris*] has been quite abundant in this vicinity. July 13 two specimens of the praying mantis [*Mantis religiosa*] were observed in this place, undoubtedly coming from the eggs sent me last spring, though I have been unable to find any young from their egg clusters. July 13. Caterpillars of the white marked tussock moth [*Noctolophus*

Leucostigma] were observed Aug. 2. Grasshoppers do not appear to have caused much damage locally, though they are very abundant. Tortoise beetle grubs [*Coptocycla* sp.] are quite plentiful and destructive to morning-glories. The yellow-necked appletree worms [*Datana ministra*] are quite numerous on appletrees. Aug. 12. The common squash bug [*Anasa tristis*] is unusually abundant. The harlequin milkweed caterpillars [*Cyenia egle*] are quite abundant in this locality. Aug. 20. Fall webworms [*Hypnania cunea*] are very plentiful on a great variety of trees. Aug. 27. American sawflies [*Cimbex americana*] were found in considerable numbers on a willow tree. Sep. 18.

Jefferson county (George Staplin jr, Mannsville)—Appletree tent-caterpillars [*Clisiocampa americana*] were hatching Ap. 30. Horn or Texas flies [*Haematobia serrata*] were observed on cattle May 10. A cluster of forest tent-caterpillars [*Clisiocampa disstria*] were found on a maple tree May 22, and also a few with appletree tent-caterpillars on appletrees. Potato and May beetles are not plentiful. Appletree tent-caterpillars are not as abundant as they were at the same date last year. Green plant lice are abundant on appletrees. The cold, damp weather has undoubtedly kept many insects in check. May 22. There are very few green worms [*Xylina* species] on appletrees. Appletree tent-caterpillars are not doing very much damage, and the forest tent-caterpillars are very scarce. Plant lice are abundant on plumbtrees, causing the leaves on the tips of the branches to curl very badly. The past week has been cold and rainy most of the time. June 13. Yellow-necked [*Datana ministra*] and red-humped [*Schizura concinna*] appletree caterpillars and fall webworms [*Hypnania cunea*] have appeared in small numbers. Grasshoppers are very plentiful in southern Jefferson and northern Oswego counties. Plum cureulios [*Conotrachelus nenuphar*] have done the most damage here. Other insects have not been plentiful enough to cause much injury except the plant lice, and they are very abundant. It has been warm and

dry for the last two or three weeks. Cabbage worms [*Pieris rapae*] are very abundant. Aug. 2. Fall webworms are very numerous on maples. Many dead grasshoppers are found in the fields. Sep. 3.

Livingston county (W. R. Houston, Geneseo)—Appletree tent-caterpillars [*Clisiocampa americana*] made their appearance Ap. 28 almost before the buds began to swell. They are just as numerous as last year. I understand that some farmers sprayed before the buds opened. The cold weather seems to keep them in check, and, though they wander over the trees, they do not seem to feed much. May 10. May 17 many nests of the appletree tent-caterpillar were seen in cherry and thorn trees beside the road, and there were also many unhatched eggs. May 24.

Montgomery county (S. H. French, Amsterdam)—The eggs of the European praying mantis [*Mantis religiosa*] were received in good condition and have been distributed as follows: one packet attached to a small rosebush in my back yard; one in the yard of a friend of mine who lives in the suburbs of the city; and the remainder in the cemetery, where there is plenty of small vegetation. Ap. 17. I have discovered no evidence of the presence in this section of the elm leaf beetle [*Galerucella luteola*] or of the forest tent-caterpillar [*Clisiocampa distria*], and I find very few nests of the appletree tent-caterpillar [*Clisiocampa americana*]. The latter are not as numerous on cherry or apple trees as usual. May 13.

Niagara county (R. L. Darrison, Lockport)—A large proportion of the winter wheat is seriously damaged by the Hessian fly [*Cecidomyia destructor*], and where but a few weeks ago there was every promise of an abundant crop, many fields are ruined, and some farmers are now plowing their wheat under. The egg cases of the praying mantis [*Mantis religiosa*] were distributed among representative farmers, nurserymen and market gardeners, but as yet none have been reported as hatched. June 13. So far only one of the egg cases of the praying mantis has developed satisfactorily. This was placed in a

box with perforations for air and left out of doors except in stormy weather. The insects began to appear on July 2 and between then and the 5th about 100 hatched. All of the egg clusters placed outside or out of doors have apparently failed to develop any insects. July 12.

Oneida county (Jeanette C. Miller, Alder Creek)—Larch sawflies [*Lygaeonematus erichsonii*] are quite destructive to some trees in this vicinity. June 19. The argus beetle [*Chelymorpha argus*] has been very abundant on bindweed in this vicinity, and the sugar maple borer [*Plagionotus speciosus*] is doing considerable damage to our shade trees. July 25. Caterpillars of the eight-spotted forester [*Alypia octomaculata*] are abundant on Virginia creeper. July 31.

Onondaga county (Mrs A. M. Armstrong-Jackson, Belle Isle)—House flies [*Musca domestica*] are appearing, wasps [*Polistes pallipes*] are becoming numerous, and the nests of the appletree tent-caterpillar [*Clisiocampa americana*] are beginning to appear. May 1. Canker worms [*Paleacrita vernata*] made their first appearance here May 10, but they are not very abundant. Some appletrees have from seven to 10 webs of the appletree tent-caterpillar on them, and, where no means have been taken to check these pests, they are doing considerable damage. The bud moth larvae occur on apple, quince and plumbtrees. Plant lice are present on currant bushes and also on the snowball tree. May 16. Forest tent-caterpillars [*Clisiocampa disstria*] were about half grown May 18, but they are not very destructive. Appletree tent-caterpillars are also doing some mischief in orchards. May 18 a white frost occurred and ice formed on the water in a pan. It apparently did not affect any caterpillars, as none were found dead, though many of them remained in their webs all day. The pistol and cigar case-bearers [*Coleophora malivorella* and *C. fletcherella*] are quite abundant on appletrees. Canker worms are not eating much and appear to grow very slowly. May 24. Potato beetles

[*Doryphora 10-lineata*] are very numerous and destructive. Grubs of the Pennsylvania soldier beetle [*Chauliognathus pennsylvanicus*] were observed feeding on little green lice. I also think that they feed on the bud moth caterpillars, as a number were found in the foliage recently occupied by them. The Hessian fly [*Cecidomyia destructor*] is quite abundant in many fields. Two weeks of almost continuous rain have somewhat retarded the development of the insects. June 7. Late sowing does not appear to be a preventive for the Hessian fly in this section. One field sown Sep. 10 was attacked by the fly and stooled freely, but none of the plants died, while in later sown fields much of the wheat was killed by the fall brood of the fly; specially was this true in fields where commercial fertilizers were used, and where the farmer was careless and allowed his fertilizer box to become empty part way across the field. A strip of Mediterranean wheat sown beside the other was very little affected by the fly, while the remainder (Gold coin) is badly infested. Canker worms are doing considerable damage in this vicinity. Two elms near by were defoliated by them. Appletree and forest tent-caterpillars are crawling about, but they are not abundant. Some cherrytrees are badly infested with plant lice, and their leaves are turning brown and drying up. Potato beetles are quite plentiful. June 14. The plum curculio [*Conotrachelus nenuphar*] has "stung" much fruit, and considerable of it is dropping, but for all that a full crop remains on the trees. The second brood of currant worms is doing considerable damage. Caterpillars are spinning up and canker worms are going into the ground. Some wheat fields in this vicinity are badly infested by the Hessian fly, while others do not appear to have suffered much. June 22.

Ontario county (J. Jay Barden, Stanley)—Appletree tent-caterpillars [*Clisiocampa americana*] appeared Ap. 25; forest tent-caterpillars [*Clisiocampa disstria*] Ap. 27; canker worms [*Paleacrita vernata*] May 6; and the common asparagus beetle [*Crioceris asparagi*] May 7.

Appletree tent-caterpillars are not abundant where they were persistently fought last year. Forest tent-caterpillars and canker worms are very abundant in orchards in the vicinity of Rushville N. Y. Pistol case-bearers [*Coleophora malivorella*] and bud moths [*Tmetocera ocellana*] are very abundant in this section. The cold weather through April has retarded the appearance of many species. The currant stem girdler [*?Janus integer*] has been more abundant than ever before, and it is doing much damage. The work of the larvae is showing very plainly at present on account of the lack of foliage on the infested stems. May 10.

Orange county (J. M. Dolph, Port Jervis)—Willow and cabbage butterflies [*Euvanesa antiopa* and *Pieris rapae*] were observed May 1, and on the 6th June beetles were seen for the first time. Many maples in this vicinity show effects of the work of the sugar maple borer [*Plagionotus speciosus*]. May 9. Currant worms [*Pteronus ribesii*] were first observed May 14, and nests of the appletree tent-caterpillar [*Clisiocampa americana*] May 15. The appletree bark louse [*Mytilaspis pomorum*] is apparently less abundant than it was last year. Reports of the prevalence of appletree tent-caterpillars in orchards have come in from various places in this section, though they do not appear to be unusually abundant in this immediate neighborhood. Cutworms are very abundant in gardens. May 27. Fall webworms [*Hyphantria cunea*] have appeared in great numbers in and about Port Jervis. They seem to have developed suddenly, and they attack a great variety of trees. Aug. 30.

Orleans county (Virgil Bogue, Albion)—Caterpillars of the giant swallowtail [*Heraclides cresspontes*] were found on my orange tree. Plant lice are somewhat abundant on plum and cherry trees in this section. My crop of cherries was nearly all wormy, probably the work of the cherry fruit fly [*Rhagoletis cingulata*]. The wheat in this vicinity is in bad condition from attacks by the Hessian fly [*Cecidomyia destructor*]. Potato beetles [*Doryphora 10-*

lineata] are very thick and doing considerable damage. July 17.

Oswego county (C. D. Cook, Oswego Center)—Appletree tent-caterpillars [*Clisiocampa americana*], bud moths [*Tmetocera ocellana*] and cigar case-bearers [*Coleophora fletcherella*] appeared about the time the buds began to develop, the two former being abundant, the tent-caterpillars being exceedingly so. No forest tent-caterpillars [*Clisiocampa disstria*] have been observed thus far. Plant lice [*Aphis mali*] are abundant on appletrees, and many cigar case-bearers can be found. May 20. Currant worms [*Pteronous ribesii*] and cutworms are numerous and causing considerable injury. Plant lice are very abundant on plum, pear and apple trees. Tent-caterpillars have not caused much injury to the trees. The cold, wet weather has retarded the development of insect life. June 5. Hessian fly [*Cecidomyia destructor*] has caused considerable damage in this vicinity. June 19. The forest tent-caterpillar has been very destructive in Yates county, the woods about Penn Yan being brown and bare in places from their work. The appletree tent-caterpillar has also been quite injurious about Penn Yan. July 8.

Otsego county (L. I. Holdredge, Oneonta)—Willow and cabbage butterflies [*Euvanessa antiopa* and *Pieris rapae*] have made an early appearance this season, and the currant plant louse [*Myzus ribis*] is present in great numbers. May 6.

Queens county (C. L. Allen, Floral Park)—Cabbage butterflies [*Pieris rapae*] appeared in large numbers about May 10. The rains have destroyed nearly all of them, however. Potato beetles [*Doryphora 10-lineata*] are less numerous than usual. June 21. The destructive pea aphid [*Nectarophora pisi*] appeared about June 18, and thus far it has done but little damage. At the present time there are few or none to be seen, the severe rains having apparently destroyed them. July 9. Fall webworms [*Hypnatria cunea*] appeared in im-

mense numbers about the middle of August, and their webs were very conspicuous on a great many trees. They are doing immense damage in this vicinity. Aug. 29.

Rensselaer county (W. C. Hitchcock, Pittstown)—Appletree tent-caterpillars [*Clisiocampa americana*] are present in immense numbers. May 20. The cold, wet weather appears to have kept both the appletree and forest tent-caterpillars [*Clisiocampa disstria*] in check, as they seem to have been very scarce. The elm leaf beetle [*Galerucella luteola*] is not proving very destructive this season. July 2. Round-headed appletree borers [*Saperda candida*] are quite injurious in this section. The trees receive little attention, and are therefore soon ruined by the borers. Grasshoppers are unusually scarce. July 15.

Rockland county (S. B. Husted, Blauvelt)—Appletree tent-caterpillars [*Clisiocampa americana*] first appeared May 4. The season has been cold and backward. May 8. We have not seen the June beetle as commonly as last year. Last month potato beetles [*Doryphora 10-lineata*] were very troublesome. Aug. 5.

St Lawrence county (Mary B. Sherman, Ogdensburg)—Shad or May flies appeared as usual June 5 and were very abundant for three days. Forest tent-caterpillars [*Clisiocampa disstria*] are scarce, only four or five having been seen during the summer. Currant worms [*Pteronous ribesii*] appeared about a week ago. There are many complaints of injury by wireworms. June 22. Caterpillars of the white marked tussock moth [*Notolophus leucostigma*] are abundant. July 8. Complaints of injury by currant worms are less frequent than usual. Plant lice are unusually abundant and destructive. July 12. Cabbage butterflies [*Pieris rapae*] are now quite abundant. A large number of cut-leaved birches have been seriously damaged, without apparent cause. [This is possibly the work of the bronze birch borer, *Agrilus anxius*.] All plant lice are unusually abundant. Many complaints are made regarding the abundance of fleas

on cats and dogs. Potato beetles [*Doryphora 10-lineata*] and cabbage worms are very abundant. Aug. 2. The birch leaf *Bucculatrix* [*Bucculatrix canadensis-ella*] is exceedingly abundant in this vicinity, having skeletonized the majority of the leaves on almost all the birches in this region. Sep. 12.

Saratoga county (Miss Rhoda Thompson, Ballston Spa)—There are fewer appletree tent-caterpillars [*Clisiocampa americana*] and more plant lice and cutworms than there have been for the last two years. Currant worms [*Pteronurus ribesii*] have also been very abundant. June 7. Rose beetles [*Macrodactylus subspinosus*], and wireworms are about as abundant as usual. Squash bugs [*Anasa tristis*] are present in enormous numbers and are causing considerable injury. July 12. There is a plague of grasshoppers in this vicinity, and they are doing a great deal of mischief. It was found they had cut off from two thirds to three fourths of the grain in a field of oats. Corn has also been much injured. Some farmers are cutting their grain before maturity in order to save it from injury.

Schenectady county (Paul Roach, Quaker Street)—Forest tent-caterpillars [*Clisiocampa disstria*] were first observed on the south side of the woods. May 5. Appletree tent-caterpillars [*Clisiocampa americana*] and forest tent-caterpillars will probably be fewer than last year. The cold, wet weather appears to have retarded the hatching of eggs and development of insect life. Bud moth larvae [*Tmetocera ocellana*] are present in small numbers. May 8. There are only a few appletree tent-caterpillars on the wild cherrytrees. The season has been cold and excessively wet, and not many of the caterpillar eggs appear to have hatched. May 31.

Schoharie county (John F. Johnson, Breakabeen)—Appletree tent-caterpillars [*Clisiocampa americana*] were first observed May 1, and forest tent-caterpillars [*Clisiocampa disstria*] May 7. The former are abundant, and the latter not more than half as numerous as last year. The cold, rainy

weather seems to have kept insect pests in check. May 13. Forest tent-caterpillars have not done much damage. They are about one third as abundant as last year. Plant lice are quite numerous on apple, plum and cherry trees. Currant worms [*Pteronus ribesii*] are quite abundant in this vicinity. June 6. Potato beetles [*Doryphora 10-lineata*] have appeared, and plant lice are quite abundant on cherrytrees, causing the leaves to shrivel and die. Forest tent-caterpillars are spinning their cocoons and have not caused much damage. Grasshoppers are present in large numbers. The moths of the forest tent-caterpillar appeared July 1 and have commenced to deposit eggs. Potato beetles are very abundant. July 11. Grasshoppers are very numerous and are injuring corn and buckwheat. Aug. 12.

Schuyler county (Harriet M. Smith, North Hector)—Appletree tent-caterpillars [*Clisiocampa americana*] were first seen May 1, canker worms [*Paleacrita vernata*] May 6. The latter have been very destructive to buds and small leaves on plumbtrees. The tent-caterpillars are very abundant, but have caused but little damage as yet. May 17. Both the common and the 12 spotted asparagus beetles [*Crioceris asparagi* and *C. 12-punctata*] are abundant. Canker worms are defoliating many maple trees. Owing to the destruction of the nests of the appletree tent-caterpillar in orchards, this pest has caused but little injury in this vicinity. The late storm has apparently killed many insects. June 7. White marked tussock moth caterpillars [*Notolophus leucostigma*] have been quite injurious to horse chestnut trees. Oats are reported as seriously damaged by a plant louse in Seneca county. July 12. I am unable to learn of any wheat being seriously injured by the Hessian fly [*Cecidomyia destructor*] in this vicinity, as most of it was sown late. June 14. Potato beetles [*Doryphora 10-lineata*] appeared for the first time this season about June 15, and they are now present in great abundance. June 21. The Hessian fly has injured wheat at North Reading. July 19.

Seneca county (J. F. Hunt, Kendaia)—Appletree tent-caterpillar [*Clisiocampa americana*] eggs hatched Ap. 26, and those of the forest tent-caterpillar [*Clisiocampa distria*] May 3. Canker worms [*Paleacrita vernata*] commenced work on appletrees about May 1. May 7. Cherry aphids [*Myzus cerasi*] have just begun to appear. Both appletree and forest tent-caterpillars are less abundant than last year. There are not so many nests of the former species to be seen. The steely blue grapevine beetle [*Haltica chalybea*] has not been seen this spring in localities where it was abundant last year. May 17. Currant worms [*Pteronous ribesii*] appeared May 20, and work of the plum curculio [*Conotrachelus nenuphar*] is now evident, but this pest is not so injurious as in former years. The forest tent-caterpillar in particular is not so abundant as it has been in recent years. Bud moths [*Tmetocera ocellana*] are more numerous than for years. Currant worms and raspberry sawflies [*Monophadnoides rubi*] are both scarce. The fruit tree bark beetle [*Scolytus rugulosus*] is working quite abundantly in plum and peach-trees, but not so badly, however, in the latter. The orchard which the canker worms defoliated last year and in which they appeared this year is now all right, the pests having been controlled by two sprayings. May 29. The work of the Hessian fly [*Cecidomyia destructor*] is now in evidence, it having destroyed about one third of some species of wheat, and there are but few curculio marks on apricots and plums. Tent-caterpillars are showing up a little more abundantly than was reported last week. There are no potato beetles [*Doryphora 10-lineata*] to speak of yet. The last week of rain has apparently had no bad effect on the caterpillars. June 7. Eggs of the potato beetle are beginning to hatch, and the parent insects are very plentiful. Tent-caterpillars are now leaving the trees and spinning cocoons. The Hessian fly is very destructive in some pieces of wheat, while in others not much is seen of it. Zebra caterpillars [*Mam-*

estra picta] were found in small numbers on a red raspberry bush. June 21. Squash bugs [*Anasa tristis*] are very numerous and in some gardens have destroyed all the vines. The small black flea beetle [*Epitrix cucumeris*] is very abundant in some bean fields. The work of what is evidently a Thrips is very plain in many timothy fields. The Hessian fly is not causing so much damage in this vicinity as was at first feared. July 10. The cherry fruit fly [*Rhagoletis cingulata*] has caused some injury in this vicinity, and I have been able to catch the flies on the fruit. I have gone over my cherry orchard twice and a part of it three times and have gathered from it the affected fruit, which was then put into vessels containing water, and the maggots drowned. I picked 25 pounds of infested cherries from four trees, and bushels of wormy ones, in my orchard. Cucumber flea beetles are quite injurious to potato vines. The Hessian fly has completely destroyed all the barley and spring wheat in this section. Winter wheat in the center of the county is good, while at each end it is badly damaged by the fly. July 24.

Tompkins county (C. E. Chapman, Peruville)—Appletree tent-caterpillars [*Clisiocampa americana*] appeared May 1, and on the 9th they were very abundant. May 14. Hessian fly larvae [*Cecidomyia destructor*] are in nearly every wheat stalk, from one to four in each. Many fields are nearly ruined, and the yield will not be more than one half the usual crop. The wheat also appears to be damaged by an insect which eats the straw nearly in two about an inch from the surface of the ground. It is probably the work of the sawfly [*Cephus pygmaeus*]. Forest and appletree tent-caterpillars are on all the trees in this section but not in sufficient numbers to cause much damage. June 25. Chinch bugs [*Blissus leucopterus*] occur here and there in small spots on different farms. One piece of millet was badly injured. They have also attacked grass among blackberry bushes. Grasshoppers are very thick, but wet weather appears to keep them in check. Squash and other vines have been nearly de-

stroyed by the common stink or squash bug [*Anasa tristis*]. The apples are much infested with codling moth larvae [*Carpocapsa pomonella*]. Potato beetles are very abundant. Aug. 20.

Ulster county (George S. Clark, Milton)—Currant worms [*Pteronous ribesii*] were first observed May 7, and only a few are to be found at the present date. Appletree tent-caterpillars [*Clisiocampa americana*] were first seen about May 1, and in sections where they were kept under control last year, there are only a few, but in other places they are doing considerable damage. May 16. Cherry aphid [*Myzus cerasi*] is rather abundant on cherry trees. May beetles are present in some numbers and are cutting the leaves of trees badly. May 31. Plant lice appear to be increasing slowly. Appletree tent-caterpillars are now wandering considerably. June 7. Cucumber flea beetles [*Epitrix cucumeris*] are at work on tomato and potato vines, injuring them considerably. Some trees in this section have been entirely defoliated by tent-caterpillars, but this is exceptional. June 14. Cherry plant lice are quite injurious to young trees. June 21. There are very few currant worms in the second brood. The potato beetles [*Doryphora 10-lineata*] are easily controlled. June 28. The lightning leaf-hopper [*Ormenis pruinosa*] is quite abundant in a pear and currant plantation, being so numerous as to partly cover many of the twigs with their cottony secretion. It is not an injurious species as a rule. July 11.

Warren county (C. L. Williams, Glens Falls)—Forest tent-caterpillars [*Clisiocampa disstria*] are generally distributed in this section, but they have not been numerous enough to cause much of any damage. The caterpillars of the white marked tussock moth [*Notolophus leucostigma*] are present in small numbers. July 5.

Wayne county (C. H. Stuart, Newark)—I am sending you a worm found in quince seedlings which proved to be the larva of the leopard moth [*Zeuzera pyrina*]. June 30. The Hessian fly [*Cecidomyia destructor*] is even worse

here this year than last, when it attacked nearly three fourths of the crop. Our season has been extremely wet, and I think that both of the tent-caterpillars and aphids have been later than usual, but now they are very abundant. June 5. Canker worms [*Paleacrita vernata*] are even worse than last year, and very little effort is being made to check them. They have attacked forest trees badly in some sections, seeming to favor the elms and spreading from them to neighboring orchards. The appletree and forest tent-caterpillars [*Clisiocampa americana* and *C. disstria*] are very abundant on apple and cherry trees, but during a long drive yesterday, I saw nests only in apple and cherry trees. This is a great contrast to last year, when they worked on nearly everything. They are now crawling along the fences, sidewalks and roads, looking for places in which to spin up. Our fields (we have some 60 acres scattered around in different places) look uniformly bad from attack by the Hessian fly. They were sowed beginning Sep. 20 and ending a week later. Our wheat is as near a complete failure as it is possible to be and yield anything. We may get 5 or 6 bushels to the acre, but we shall probably plow the greater part of it. Both asparagus beetles are present here, but the 12 spotted one [*Crioceris 12-punctata*] is rare. The common form [*Crioceris asparagi*] is so bad that it is almost impossible to find any asparagus on the market except that which is covered with its eggs. June 11. I am mailing a number of apricot twigs infested with what is apparently a peach twig moth. [*Cenopsis diluticostana* Walsm., kindly determined by Prof. C. H. Fernald, subsequently was bred from these twigs.] The pale striped flea beetle [*Systenata eniata*] observed by us working on seedling apple-trees last year, is now attacking sugar beets. June 24. The small beetles [*Notoxus anchora*] sent herewith are very numerous around the roots of wheat. In our seed bed we have several varieties of wheat, all of which were badly injured by the Hessian fly except a check row of "Dawson's golden chaff," not a single straw of which is down. This check row was sown

by hand, the rest by machine, and was put in about 1 inch deeper than the rest. All the varieties were sown at about the same time. June 28.

Westchester county (Mrs. Edwin H. Mairs, Irvington-on-Hudson)—Appletree tent-caterpillars [*Clisiocampa americana*] were observed in immense numbers. May 7. We have had few warm days and a great deal of cold wet weather, which has kept insect life pretty well in check. May 14. The grapevine plume moth caterpillars [*Oxyptilus periscelidactylus*] are doing some injury to grapevines. The beech aphid [*Phyllaphis fagi*] is present on purple beeches. Appletree tent-caterpillars are still very abundant. May 29. They are now leaving the trees and crawling in every direction in search of places in which to spin up. In one orchard I saw enough of them to stock the earth. June 6. Green June beetles [*Allorhina nitida*] were first observed July 7. They eat out the buds of the common flowers and are destroying the plants. This is the insect which has been reported in the newspapers as the wonderful "flying, boring bug." Spotted grapevine beetles [*Pelidnota punctata*] have appeared in great numbers. The common June beetles are somewhat troublesome. White marked tussock moth caterpillars [*Notolophus leucostigma*] are present in small numbers. July 20. Fall webworms [*Hypantria cunea*] are very abundant in this section, and their nests can be seen on a great variety of trees and shrubs. Sep. 6.

Wyoming county (W. H. Roper, Wyoming)—Appletree tent-caterpillars [*Clisiocampa disstria*] appeared May 2. They are plentiful, but are not doing much damage as yet, since the weather is cool and damp. May 13. They have not been working for the last three days, because the weather has been cold, but not cold enough to kill them. May 17. The tent-caterpillars are doing a great deal of damage in this locality where the trees have not been sprayed. The canker worm [*Paleacrita vernata*] has also made his appearance and is causing a great deal of injury. Had it not been for the

cold, wet weather, the caterpillars would have caused a great deal more damage than they have. May 29. Tent-caterpillars and canker worms are devouring the foliage very rapidly in some orchards. The latter are not doing as much injury in the woods this year as last. June 7. I find no canker worms in my orchard, but there are a great many in this vicinity, and the elm-trees are full of them. Some trees have been entirely defoliated. The Hessian fly [*Cecidomyia destructor*] has caused a great deal of injury to wheat in this section, and many crops will not be harvested because there is nothing worth cutting. The white wheat has been severely injured, while the red wheat has apparently escaped with little or no harm. June 19. I have four acres of white wheat which was sown Sep. 19. It has not been injured by the fly. It is known as the "Genesee giant." The straw is very coarse and stands up in fine shape. My no. 6, sowed the next day, is about one half gone. The wheat on the hills has been injured much more than that in the valley. July 3.

LIST OF PUBLICATIONS OF THE ENTOMOLOGIST

The following is a list of the principal publications of the entomologist during the year 1901. 62 are given with title,¹ place and time of publication and a summary of the contents of each. Volume and page numbers are separated by a colon, the first superior figure tells the column, and the second the exact place in the column in ninths; e. g. 65: 862¹⁸ means vol. 65, p. 862, column 1, beginning in the eighth ninth, i. e. about eight ninths of the way down.

Grain moth (Country gentleman, 25 Oct. 1900, 65: 862¹⁸)

The attack on wheat at Highlands N. J. is identified as that of *Sitotroga cerealella* Oliv.

Woolly aphis (Country gentleman, 25 Oct. 1900, 65: 862⁴⁴)

Identifies and gives remedies for *Schizoneura lanigera* Hausm. attack on appletrees at Troy N. Y.

¹Titles are given as published; and in some instances they have been changed or supplied by the editors of the various papers.

Whale oil soap experiments (Country gentleman, 1 Nov. 1900, 65: 884⁴¹)

Gives results obtained with Good's whale oil soap.

Celery *Plusia* (Country gentleman, 1 Nov. 1900, 65: 884-85⁴⁶)

Plusia simplex Guen. is identified from Colora Md., its life history is given, and remedies indicated. *Ormenis* [*Poeciloptera*] *septentrionalis* Spin. is mentioned.

Some effects of early spring applications of insecticides on fruit trees (U. S. dep't agric. div. ent. Bul. 26, n. s. 1900. [rec'd Nov. 8] p. 22-25)

Gives effects of kerosene, crude petroleum and whale oil soaps in various dilutions and mixtures.

Hessian fly (Country gentleman, 22 Nov. 1900, 65: 942²⁵)

Gives rule for ascertaining date of disappearance of [*Cecidomyia destructor* Say] and recommends preventive measures.

Remedies for San José scale (Country gentleman, 29 Nov. 1900, 65: 965²¹)

Summarizes results obtained with kerosene, crude petroleum, whale oil soaps and hydrocyanic acid gas. A 20% mechanical emulsion of crude petroleum proved very satisfactory. Whale oil soap was not so efficient. Hydrocyanic acid gas was the most satisfactory, but its application is limited on account of the costly tents.

Scale on Japan plum (American gardening, 8 Dec. 1900, 21: 811²¹)

San José scale, *Aspidiotus perniciosus* Comst., from Rye N. Y., is identified, and early spring treatment with whale oil soap or crude petroleum advised.

Work of the state entomologist (Albany evening journal, 18 Dec. 1900, p. 4)

Replying to a suggestion, the work of the office is briefly outlined.

Wheat damaged by moth (Country gentleman, 10 Jan. 1901, 66: 24³²)

Gives remedies for Angoumois or grain moth, *Sitotroga cerealia* Oliv., which is reported abundant in New Jersey.

Serious injury by bark-borers (Riverhead [N. Y.] news, 26 Jan. 1901, p. 1-30 cm)

A brief account of injuries to hard pines at Manor L. I. by *Tomicus calligraphus* Germ., *T. cacographus* Lec. and *Dendroctonus terebrans* Oliv. Several preventive measures are advised.

Wireworms (Country gentleman, 28 Feb. 1901, 66: 168)

The larva of *Melanotus communis* Gyll. from Orange county, N. Y. is identified, and several preventive and repressive measures advised.

[Insect lessons of the year] (Country gentleman, 28 Feb. 1901, 66: 170²⁴, 7 Mar. p. 192)

Extracts from report of committee on insects of Eastern N. Y. horticultural society, in which the following are noticed: pale striped flea beetle, *Systema taeniata* Say, gipsy moth, *Porthetria dispar* Linn., appletree aphid, *Aphis mali* Fabr., cherrytree aphid, *Myzus cerasi* Fabr., destructive pea louse, *Nectarophora pisi* Kalt., white flower cricket, *Oecanthus niveus* DeG., the minute black lady-beetle, *Pentilia misella* Lec., fruit tree bark beetle, *Scolytus rugulosus* Ratz., palmer worm, *Ypsolophus pometellus* Harr., forest tent-caterpillar, *Clisiocampa distria* Hübn. and the leopard moth, *Zeuzera pyrina* Fabr. The second part is a discussion of results obtained in experiments against San José scale with kerosene, whale oil soap and crude petroleum in various combinations.

Scurfy bark louse (Country gentleman, 28 Mar. 1901, 66: 256-57⁴⁶)

Chionaspis furfura Fitch on pear and apple trees is briefly characterized, and remedies given.

Grapevine *Aspidiotus* (Country gentleman, 4 Ap. 1901, 66: 278-79⁴⁷)

Aspidiotus uvae Comst. from Nashville Tenn. is identified, compared briefly with the San José scale, and remedial measures are indicated.

Injurious insects and how to control them. (N. Y. state agric. soc. Rep't 1899. 1900. pt 2. Bureau of farmers institutes. Rep't [issued 15 Ap. 1901] p. 267-93. Also Dep't agric. 7th rep't. 1900. v. 3, pt 2, p. 59-85)

General paper treating of a number of insects, the appletree tent-caterpillar, *Clisiocampa americana* Fabr., forest tent-caterpillar, *Clisiocampa distria* Hübn., codling moth, *Carpocapsa pomonella* Linn., sugar maple borer, *Plagionotus speciosus* Say, elm borer, *Saperda tridentata* Oliv., elm leaf beetle, *Galerucella luteola* Müll., appletree and scurfy bark lice, *Mytilaspis pomorum* Bouché and *Chionaspis furfura* Fitch, and the San José scale, *Aspidiotus perniciosus* Comst. being specially mentioned.

A large number of the more important insect pests are briefly characterized, and remedies for them are given in the reprinted catalogue of the collection exhibited at certain institutes.

Household insects (N. Y. state agric. soc. Rep't, 1899. 1900. pt 2 Bureau of farmers institutes. Rep't [issued 15 Ap. 1901] p. 294-303. Also Dep't agric. 7th rep't. 1900. v. 3, pt 2, p. 86-95)

A general paper treating of the following: mosquitos, *Culex*, house fly, *Musca domestica* Linn., fleas, *Ceratopsyllus serraticeps* Gerv., carpet beetles, *Anthrenus serophulariae* Linn. and *Attagenus piceus* Oliv. and clothes moths, *Tinea pellionella* Linn. and others, house ants, *Monomorium pharaonis* Linn. and others, cockroaches, *Phyllodromia germanica* Fabr. and *Periplaneta orientalis* Linn., bedbug, *Acanthia lectularia* Linn., larder beetle, *Dermestes lardarius* Linn., cheese or ham skipper, *Piophilha casei* Linn., fruit flies, *Drosophila ampelophila* Loew, bristle tail or fish moth, *Thermobia furnorum* Rov.

16th report of the state entomologist on injurious and other insects of the state of New York (N. Y. state mus. Bul. 36. 1901. [issued 25 Ap.] p. 949-1063)

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¹ General account of each, giving life history and habits.

² Brief records of some of the more interesting facts brought to notice in 1900.

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Tent-caterpillars (Country gentleman, 9 May 1901, 66: 386²⁴)

Remedies are given for both species.

Enemies of trees (Troy daily times, 10 May 1901, 37cm)

Brief general accounts of the elm leaf beetle, *Galerucella luteola* Müll., forest tent-caterpillar, *Clisiocampa disstria* Hübn., and the elm bark louse, *Gossyparia ulmi* Geoff.

Entomologic service of New York (Country gentleman, 16 May 1901, 66: 403²²)

Summary of reports from voluntary observers.

Trap-lanterns—Warning (Country gentleman, 16 May 1901, 66: 406¹⁷; New York farmer, 16 May 1901, p. 3)

Statement to the effect that trap lanterns are of value in only a few very special cases.

Spraying and poultry (Country gentleman, 23 May 1901, 66: 423²³)

Grass under properly sprayed trees will not be injurious to poultry.

Scale on raspberry (Country gentleman, 23 May 1901, 66: 423²³)

Aulacaspis rosae Sandb. from Concordville Pa. is identified, and the proper treatment indicated.

Hessian fly—borers (Country gentleman, 30 May 1901, 66: 442²⁷)

Preventive methods are given for *Cecidomyia destructor* Say, the fruit tree bark-borer, *Scolytus rugulosus* Ratz., and the locust borer, *Cyllene robiniae* Forst.

Entomologic service of New York (Country gentleman, 30 May 1901, 66: 443¹³)

Summary of reports from voluntary observers.

Recent problems in the control of insects depredating on fruit trees (Mass. fruit growers ass'n. 7th rep't. 1901 [rec'd 6 June] p. 27-45)

The following topics are treated: Care of literature, Dissemination of insects, Results obtained in 1900 with insecticides, the latter principally a discussion of kerosene, whale oil soaps and crude petroleum.

Voluntary entomologic service of New York state (Country gentleman, 6 June 1901, 66: 462-63⁴⁷)

Summary of reports from voluntary observers.

Voluntary entomologic service of New York state (Country gentleman, 13 June 1901, 66: 482³⁴)

Summary of reports from voluntary observers.

Hessian fly (Country gentleman, 13 June 1901, 66: 486⁴²; New York farmer, 13 June 1901, p. 8; — 27 June, p. 7; American agriculturist, 22 June 1901, p. 816, col. 1)

Brief statement of injuries by Hessian fly. *Cecidomyia destructor* Say, and a request for data concerning infested fields.

Hickory gall—San José scale (Country gentleman, 20 June 1901, 66: 502³⁵)

The life history and characteristics of *Phylloxera caryaecaulis* Fitch are briefly given, and *Aspidiotus perniciosus* Comst. is identified. Both are from Bedford Station N. Y.

Voluntary entomologic service of New York state (Country gentleman, 20 June 1901, 66: 503¹⁴)

Summary of reports from voluntary observers.

Voluntary entomologic service of New York state (Country gentleman, 27 June 1901, 66: 523²³)

Summary of reports from voluntary observers.

Lunate long sting (Country gentleman, 4 July 1901, 66: 542-43⁴⁶)

A brief notice of *Thalassa lunator* Fabr. from Loudonville N. Y., with mention of its host, the pigeon tremex, *Tremex columba* Linn.

Voluntary entomologic service of New York (Country gentleman, 4 July 1901, 66: 543²³)

Summary of reports from voluntary observers.

Fruit tree bark beetle (Country gentleman, 4 July 1901, 66: 554¹¹)

Brief general account of *Scolytus rugulosus* Ratz. in New York state.

Squash bug (Country gentleman, 11 July 1901, 66: 562³²)

Anasa tristis DeG. is figured and briefly noticed.

Voluntary entomologic service of New York state (Country gentleman, 11 July 1901, 66: 563¹⁷)

Summary of reports from voluntary observers.

Leaf-cutter bee (Country gentleman, 18 July 1901, 66: 582³³)

Cells of *Megachile* species from Chase Lake N. Y. are identified and the habits of insect given.

Voluntary entomologic service of New York (Country gentleman, 18 July 1901, 66: 583¹³)

Summary of reports from voluntary observers.

Voluntary entomologic service of New York (Country gentleman, 25 July 1901, 66: 603¹³)

Summary of reports from voluntary observers.

Plum curculio (Country gentleman, 25 July 1901, 66: 604²⁶)

Work of beetles of *Conotrachelus nenuphar* Hbst. on plum leaves is identified, and remedy given. Codling moth larvae in quince and a blight noticed briefly. All were from Setauket L. I.

Voluntary entomologic service of New York (Country gentleman, 1 Aug. 1901, 66: 623¹³)

Summary of reports from voluntary observers.

Larch lappet (Country gentleman, 8 Aug. 1901, 66: 642²³)

The larva of *Tolype laricis* Fitch from Coldwater N. Y. is identified, and its peculiarities sketched.

Voluntary entomologic service of New York state (Country gentleman, 8 Aug. 1901, 66: 442-43⁴⁸)

Summary of reports from voluntary observers.

A great insect book (Country gentleman, 8 Aug. 1901, 66: 646-47⁴⁵)

A review, with some editorial additions, of the *Insect book* by Dr L. O. Howard.

Rabbit botfly (Poultry monthly [Albany N. Y.] Sep. 1901, p. 497-98)

Identifies maggot from Belgian hare in New York as probably *Cuterebra cuniculi* Clark and gives its life history briefly and remedies.

Borers in shade trees (American gardening, 10 Aug. 1901, 22: 558)

Poplar borer at New York is possibly *Saperda calcarata* Say. Injection of carbon bisulphid is recommended, or the use of potassium cyanid.

Blister beetles (Country gentleman, 15 Aug. 1901, 66: 662¹⁷)

Margined blister beetle, *Epicauta cinerea* Forst., from Lahaska Pa. is identified, and remedies given.

Cicada-killer (Country gentleman, 22 Aug. 1901, 66: 682²⁴)

Sphecius speciosus Drury from Stillwater N. J. is identified, and its occurrence at Karner N. Y. recorded.

Sugar maples injured (Country gentleman, 19 Sep. 1901, 66: 762⁴⁷)

The depredator at Dutchess county, N. Y., is identified as probably *Cacoecia argyrosphila* Walk.

Ichneumon fly (Country gentleman, 26 Sep. 1901, 66: 782¹⁴)

Paniscus geminatus Say from Croton on Hudson N. Y. is described and identified.

Orange dog (Country gentleman, 26 Sep. 1901, 66: 782¹⁵)

The larva of *Heraclides crespfontes* Cram. from Albany N. Y. is described, and its unusual abundance in New York noted.

Angoumois moth (Country gentleman, 26 Sep. 1901, 66: 782²⁴)

Sitotroga cerealella Oliv. from Smithtown L. I. is identified, and remedial measures given.

Birch leaf *Bucculatrix* (Country gentleman, 26 Sep. 1901, 66: 787²⁹)

A brief account of the prevalence and destructiveness of *Bucculatrix canadensisella* Chamb. in New York state.

Golden oak scale and leaf feeder (Country gentleman, 26 Sep. 1901, 66: 789²³)

This scale, *Asterolecanium variolosum* Ratz., is described, remedies given and the leaf feeder identified as possibly *Symmerista albifrons* Abb. & Sm.

Ants on fig trees (Country gentleman, 26 Sep. 1901, 66: 789²⁸)

Several means of keeping these insects out of trees are discussed. The ants are said to devour the fruit.

Celery worms (Country gentleman, 26 Sep. 1901, 66: 789²⁵)

The caterpillar, *Papilio polyxenes* Fabr., from Islip L. I. is described, and the use of slug shot on celery discountenanced. Hand picking is advised.

Saddle back caterpillar (Country gentleman, 26 Sep. 1901, 66: 789³⁸)

The larva of *Sibine stimulea* Clem., from Greenwich Ct., is described, and its food plants given.

Hessian fly in New York state (Country gentleman, 3 Oct. 1901, 66: 799⁴³–800¹⁴)

Summary account of injuries by *Cecidomyia destructor* Say, with remedial measures.

Appletree borer (Country gentleman, 3 Oct. 1901, 66: 803²⁸)

Remedial and preventive measures for *Saperda candida* Fabr. are given.

Borers and plant lice (Country gentleman, 10 Oct. 1901, 66: 829¹¹)

A general account of injuries to firs in the Adirondacks by *Tomiscus balsameus* Lec. with mention of other species. General directions are given for the use of insecticides.

CONTRIBUTIONS TO COLLECTION 16 OCT. 1900–15 OCT. 1901

Hymenoptera

Apis mellifica Linn., honey bee, queen and workers, 5 Oct.; from **Harold Horner**, Mount Holly N. J.

Xylocopa virginica Drury, carpenter bee, pupae in hard pine board, 30 July; from **James F. Feeney**, Albany N. Y.

Megachile sp.; cells, 23 July; from **Harriet M. Smith**, North Hector N. Y.

Vespa maculata Linn., white-faced hornet, nest, 30 Ap.; from Mrs **C. L. Hoffman**, Castleton N. Y. Large nest of same, 19 Ap.; from **Samuel Brutkus**, New Baltimore N. Y.

Sphecius speciosus Drury, cicada-killer, adult, 12 Aug.; from **S. P.**, Stillwater N. J.

Sphex ichneumonea Linn., 8 Sep.; from Miss **Eliza S. Blunt**, New Russia N. Y.

? *Sphaerophthalma occidentalis* Linn., velvet ant, 7 Sep.; from Dr **M. W. Van Denburg**, Mount Vernon N. Y.

Dibrachys boucheanus Ratz., adults issuing from braconid cocoons on a sphingid larva, 13 Aug.; from **B. F. Koons**, Storrs Ct.

Thalessa lunator Fabr., lunate long sting, adult, 25 June; from **C. S. Bradt**, Albany N. Y. Same, 25 June; from **L. Tucker & Son**, Albany N. Y. Same, 28 July; from **C. W. Walker**, McGregor Ia. Same, 13 Sep.; from **C. J. Moore**, Albany N. Y.

Thalessa atrata Fabr., black long sting, adult, 29 May; from **O. Q. Flint**, Athens N. Y. Same, 25 June; from **C. S. Bradt**, Albany N. Y. Same, 2 July; from **Fred Calhoun**, Albany N. Y.

Paniscus geminatus Say, adult, 18 Sep.; from **J. H. H.**, Croton on Hudson N. Y.

Tremex columba Linn., pigeon tremex, adult on decayed and dying elm, 24 Aug.; from **Jeanette C. Miller**, Aldercreek N. Y.

? *Cephus pygmaeus* Linn., wheat sawfly, larvae in wheat stalks, 9 July; from **C. H. Stuart**, Newark N. Y.

Lygaeonematus erichsonii Hartig., larch sawfly, larvae on larch, 19 June; **Jeanette C. Miller**, Aldercreek N. Y.

Cimbex americana Leach, American sawfly, adult, 5 June; from **Dr J. Benton Tipton**, Albany N. Y. Larvae of same on willow, 16 Sep.; from **G. S. Graves**, Newport N. Y. They must have been very abundant, as numerous examples were sent.

Coleoptera

Scolytus rugulosus Ratz., fruit tree bark beetle, larvae and pupae on peach, 16 Mar.; from **J. A. Hepworth**, Marlboro N. Y. Same on plum, 25 June; **A. M. W.**, Troy N. Y.

Madarus undulatus Say., adult from fruit of thorn bush, 10 Oct.; from **C. H. Peck**, Lansingburg N. Y.

Balaninus rectus Say, chestnut weevil, adult, July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Conotrachelus nenuphar Herbst., plum curculio, adult work on plum leaves, 12 July; from **S. B. Strong**, Setauket N. Y.

Lixus concavus Say, rhubarb curculio, adult, 5 June; from **J. H. Ball**, North Nassau N. Y.

Hylobius confusus Kirby, adult, 10 June; from **Charles Heindel**, Albany N. Y.

Hylobius pales Herbst., pales weevil, adult, 5 Nov.; from **G. W. Cravens**, Schenectady N. Y. Same, 6 May; from **C. H. Peck**, Menands N. Y.

Epicauta pennsylvanica DeG., black blister beetle, adults seriously injuring sugar beets and destroying some patches, 15 Aug.; from **J. W. Calkins**, Cobleskill N. Y. Same on potato vines and china asters, 30 Aug.; from **Ira L. Peck**, Charleston Four Corners N. Y.

Epicauta cinerea Forst., margined blister beetle, adults on anemones, 5 Aug.; from **R. M.**, Lahaska Pa.

Epicauta vittata Fabr., striped blister beetle, very numerous on beets, potatoes, beans, tomatoes, 16 Aug.; from Senator **Ambler**, Valatie N. Y. They are said to have eaten up all the beets and tomatoes and now to be devouring the potatoes.

Notoxus anchora Hentz., adults numerous around the roots of wheat, 27 June; from **C. H. Stuart**, Newark N. Y.

Pytho americanus Kirby, adults, under decaying bark, 18 Nov.; from **J. A. Otterson**, Berlin Mass.

Diaperis hydni Fabr. from *Polyporus spumeus*, 9 Oct.; from Mrs **Dallus**, Buena Vista Spring Pa.

Tenebrio molitor Linn., meal worm, pupae, found in a trunk, 28 May; from **George H. Hunter**, Albany N. Y. Same 23 Aug.; from **Jeanette C. Miller**, Aldercreek N. Y.

Upis ceramboides Linn., 27 May; from **Eliza S. B. Blunt**, New Russia N. Y.

Chelymorpha argus Licht., argus beetle, larvae, pupae, adults on bindweed, 23 July; from **Jeanette C. Miller**, Aldercreek N. Y.

Systema hudsonias Forst., red-headed flea beetle, adults on grape, 7 Aug.; from **J. J. Barden**, Fredonia N. Y.

Crepidodera cucumeris Harr., cucumber flea beetle, adults on bean and potato vines, 24 July; from **J. F. Hunt**, Kendaia N. Y.

Disonycha collaris Fabr., spinach flea beetle, larva on spinach, 3 July; from **G. S. Graves**, Newport N. Y.

Galerucella luteola Mill., elm leaf beetle on elm, 6 Aug.; from **Jane Bassett**, Bridgewater Mass.

Doryphora 10-lineata Say, potato beetle, work of adult on stalks of potatoes, 2 July; from **J. F. Rose**, South Byron N. Y.

Colaspis brunnea Fabr., brown Colaspis, adult on grapevine, 7 Aug.; from **J. J. Barden**, Fredonia N. Y.

Typophorus canellus Fabr., strawberry root worm, on elm, 6 June; from **Cyrus R. Crosby**, Cranberry Creek N. Y.

Chrysochus auratus Fabr., gold gilt beetle, adult, July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Fidia viticida Walsh., grape root worm, adults on grape, 10 May; from **F. M. Webster**, Euclid O. Same on grape leaves, 5 and 7 Aug.; from **J. J. Barden**, Fredonia N. Y.

Oberea bimaculata Oliv., work of raspberry cane-borer, 22 July; from **Mrs H. E. Robinson**, North Nassau N. Y.

Monohammus confusor Kirby, pine sawyer, adult, 19 July; from **W. S. Hammond**, Albany N. Y. Same July; from **C. H. Peck**, North Elba N. Y.

Rhagium lineatum Oliv., ribbed Rhagium, larva under bark of pine, 18 Nov.; from **J. A. Otterson**, Berlin Mass.

Desmocerus palliatus Forst., cloaked knotty horn, adult, July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Plagionotus speciosus Say, sugar maple borer, adult, 23 July; from **Jeanette C. Miller**, Aldercreek N. Y.

Cyllene pictus Drury, hickory borer, adults from hickory logs, 15 Ap.; from **Eliza S. Blunt**, Brooklyn N. Y. Same 15 June; from **G. G. Atwood**, Albany N. Y.

Prionus laticollis Drury, broad-necked Prionus, adult, July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Allorhina nitida Linn., green June beetle, adult, July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Pelidnota punctata Linn., spotted grapevine beetle, adult on Ampelopsis, 15 July; from **J. L. Appleton**, Albany N. Y.

Anomala lucicola Fabr., light-loving grapevine beetle, adults at roots of peachtree, 28 May and July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Laehnosterma fusca Frohl., May beetle, 27 May; from **Eliza S. Blunt**, New Russia N. Y. Larva of same on aster, 23 July; from **L. Menand**, Albany N. Y.

Geotrupes egeriei Germ., adult, 28 May; from Mrs **E. H. Mairs**, Irvington-on-Hudson N. Y.

Lucanus dama Thunb., stag beetle, adult, 19 July; from Prof. **H. P. Whitlock**, Catskill N. Y.

Ptilinus ruficornis Say, adults in maple and birch flooring, 11 July; from Dr **S. B. Ward**, Saranac Inn N. Y.

Melanotus communis Gyll., common snapping beetle, larva attacking potatoes, Feb.; from **J. C. B.**, Orange county. Same 15 June; from **G. G. Atwood**, Albany N. Y. Same July; from Mrs **E. H. Mairs**, Irvington-on-Hudson N. Y.

Alaus myops Fab., adult, 5 Oct.; from **H. N. Otterson**, Bolton Mass. Same 9 Oct.; from Prof. **F. C. Paulmier**, Rensselaerville lake, N. Y.

Alaus oculatus Linn., owl beetle, adult, 20 June; from **J. Baumgarten**, New York N. Y. Same 24 June; from **J. D. Wasson**, Altamont N. Y. Same 24 June; from **Marie Walker**, Athens N. Y. Same July; from Mrs **E. H. Mairs**, Irvington-on-Hudson N. Y. Same 10 July; from **J. F. Johnson**, Breakabeen N. Y.

Anthrenus verbasci Linn., museum pest, pupae and larvae feeding in stored silk worm cocoons and also strands of spun silk floss, 16 Feb.; from Miss **Jennie Utter**, Albany N. Y. Same adults, 17 Ap.; from **B. F. Koons**, Storrs Ct.

Anthrenus scrophulariae Linn., Buffalo carpet beetle, adults and larval skins on Zanzibar gum, 14 Nov.; from **John Wallace**, Albany N. Y.

Trogoderma ? tarsale Melsh., larval skin from old book, 5 Nov.; from **G. W. Cravens**, Schenectady N. Y.

Attagenus piceus Oliv., black carpet beetle, larva in tea, 9 Feb.; from **B. O. Burgin**, Albany N. Y. Larvae of same in stored silkworm cocoons, etc., 16 Feb.; from Miss **Jennie Utter**, Albany N. Y. Larvae of same found in garments, 26 Ap.; from Prof. **F. C. Paulmier**, Albany N. Y.

Anatis ocellata Linn., 15 spotted ladybug, larvae, pupae on American elm, 27 June; from **M. E. Woodbridge**, Binghamton N. Y. Same 6 July; from **Mary B. Sherman**, Ogdensburg N. Y.

Philonthus aeneus Rossi., adult, in garbage heap, 11 May; from Mrs **F. J. Riggs**, Albany N. Y.

Dytiscus fasciventris Say, two adults in a cistern, 18 Mar.; from **M. G. Thomas**, Schaghticoke N. Y.

Bradycellus rupestris Say, adult, 1901; from **C. A. Otterson**, Berlin Mass.

Harpalus pennsylvanicus DeG., Pennsylvania ground beetle, adult, 7 June; from **Marguerite Riggs**, Albany N. Y. Same 1901; from **C. A. Otterson**, Berlin Mass.

Harpalus erraticus Say, 27 May; from **Eliza S. Blunt**, New Russia N. Y.

Agonoderus pallipes Fabr., adult, July; from Mrs **E. H. Mairs**, Irvington-on-Hudson N. Y. Same 1901; from **C. A. Otterson**, Berlin Mass.

Calosoma calidum Fabr., fiery hunter, adult, 15 June; from **M. B. Sherman**, Ogdensburg N. Y.

Calosoma scrutator Fabr., searcher, adult, 7 June; from **F. J. Riggs**, Albany N. Y.

Cicindela punctulata Fabr., adult, 8 Feb.; from Dr **J. S. Smith**, Troy N. Y.; from Kansas.

Cicindela repanda Dej., repand tiger beetle, adult, 29 May; from **Eliza S. Blunt**, New Russia N. Y.

Cicindela formosa Say, adult, 8 Feb.; from Dr **J. A. Smith**, Troy N. Y.; from Kansas.

Cicindela audubonii Lec., adult, 8 Feb.; from Dr **J. A. Smith**, Troy N. Y.; from Kansas.

Cicindela pulchra Say, adult, 8 Feb.; from Dr **J. A. Smith**, Troy N. Y.; from Kansas.

Tetracha carolina Linn., adult, 8 Feb.; from Dr **J. A. Smith**, Troy N. Y.; from Kansas.

Diptera

Melophagus ovinus Linn., sheep tick, adult, 1901; from **C. A. Otterson**, Berlin Mass.

Rhagoletis cingulata Loew., cherry fruit fly, adults and puparia on cherries, 24 July; from **J. F. Hunt**, Kendaia N. Y.

?*Phorbia fusciceps* Zett., fringed anthomyian, work on seedling beans, 7 July and 1 Aug.; from **J. F. Rose**, South Byron N. Y.

Pegomyia affinis Stein., from **J. M. Aldrich**, Moscow, Idaho; from Algonquin Ill.

Stomoxys calcitrans Linn., stable fly on window, 22 Nov.; from **Mrs F. J. Riggs**, Albany N. Y.

Sarcophaga? sp., flesh fly, adult, 14 Sep.; from **W. C. Hitchcock**, Pittstown N. Y.

Cuterebra cuniculi? Clark, the rabbit botfly, larva from a kitten, 19 Aug.; from **D. T. Meskil**, Highland Falls N. Y. Same from Belgian hare, 8 Aug.; from **Fred Harris**, New York.

Hypoderma lineata Villers, warble fly, nearly full grown larvae on cattle, 13 Ap.; from **G. S. Graves**, Newport N. Y.

Eristalis tenax Linn., drone fly, pupae in water, 9 July; from **S. T. Hudson**, Riverhead N. Y.

Tabanus reinwardtii Wied., adult, June 5; from **Dr J. Benton Tipton**, Albany N. Y. Same 10 June; from **Charles Heindel**, Albany N. Y.

Chrysops excitans Walk., adult, 5 June; from **Dr J. Benton Tipton**, Albany N. Y.

Bibio albipennis Say, white winged Bibio, adults on herbage, 29 May; from **Eliza S. Blunt**, New Russia N. Y.

Rhabdophaga salicis Schrk., pupae, adults on basket willow, 1 June; from **H. C. Peck**, Rochester N. Y.

Cecidomyia destructor Say, Hessian fly, pupae on grain, 5 and 11 June; from **C. H. Stuart**, Newark N. Y. Same on wheat, 13 June; from **J. F. Hunt**, Kendaia N. Y. Same on wheat 17 or 18 June; from **Mrs A. M. A. Jackson**, Belle Isle N. Y.

Lepidoptera

Basilarchia archippus Cram., viceroy, 2d stage larva on apple, 19 July; from **P. L. Husted**, Highland N. Y.

Phyciodes tharos Drury, adult, 15 July; from **W. C. Hitchcock**, Pittstown N. Y.

Eugonia j-album Bd.-Lec., Compton tortoise, adult, 21 Aug.; from **G. S. Graves**, Newport N. Y.

Euvanesa antiopa Linn., spiny elm caterpillar, larva on willow, 17 Sep.; from **G. S. Graves**, Newport N. Y.

Cyaniris ?pseudargiolus Bd.-Lec., larva on apple, 4 June; from **Harriet W. Smith**, North Hector N. Y.

Jasoniades glaucus Linn., tiger swallowtail, adult, 15 July; from **W. C. Hitchcock**, Pittstown N. Y.

Heraclides cresphontes Cram., giant swallowtail, 3 larvae on prickly ash, July 8; from **P. W. King**, Athens N. Y. Same on fraxinella, 12 July; from **C. A. Deyo**, Schoharie N. Y. Same on orange, 16 July; from **Virgil Bogue**, Albion N. Y. Same on hop hornbeam, July; from **Gen. J. H. Patterson**, Selkirk N. Y. Adult of same, 23 Aug.; from **Mrs Abram Lansing**, Albany N. Y. Larva of same on fraxinella, 11 Sep.; from **Alice G. Fisher**, Batavia N. Y. Same on *Dictamnus fraxinella*, 17 Sep.; from **O. A. Lansing**, Albany county.

Papilio polyxenes Fabr., black swallowtail, larva on caraway, 3 July; from **G. S. Graves**, Newport N. Y.

Amphionessus Cram. adult, 12 June; from **O. Q. Flint**, Athens N. Y.

?*Thyreus abbotii* Swain, the abbot sphinx, young larva on ampelopsis, 15 July; from **R. Thompson**, Ballston Spa N. Y.

Deilephila lineata Fabr., the white lined sphinx, adult on flowers, 26 Aug.; from **F. L. Lill**, East Bethlehem N. Y.

Philampelus pandorus Hübn. pandorus sphinx; larva (parasited) on ampelopsis, 9 Sep.; from **Cyrus R. Crosby**, Cranberry Creek N. Y.

Ampelophaga myron Cram., green grapevine sphinx, larva on grapevine, 10 July; from **T. W. King**, Athens N. Y.

Same on Virginia creeper, 11 Aug.; from **Jeanette C. Miller**, Aldercreek N. Y.

Phlegethontius celeus Hübn., tomato or potato worm, pupa in soil, 9 May; from **G. F. Bixby**, Plattsburg N. Y. Same 23 May; from **G. S. Graves**, Newport N. Y.

Phlegethontius carolina Linn., tobacco worm, larva on potato, 18 July; from **C. C. Hardenbergh**, Stoneridge N. Y.

Alypia octomaculata Hübn., eight spotted forester, larva on Virginia creeper, 22 July; from **Mrs H. E. Robinson**, North Nassau N. Y. Same 30 July; from **Jeanette C. Miller**, Aldercreek N. Y.

Arctia virguncula Kirby, adult, 15 July; from **W. C. Hitchcock**, Pittstown N. Y.

Spilosoma virginica Fabr., yellow woolly bear, adult in spider's web, 15 July; from **G. S. Graves**, Newport N. Y. Same 15 July; from **W. C. Hitchcock**, Pittstown N. Y. Same July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Hyphantria cunea Drury, fall webworm, adult, 15 July; from **W. C. Hitchcock**, Pittstown N. Y. Same on catalpa, 27 Aug.; from **C. L. Allen**, Floral Park N. Y. Same 5 Sep.; from **Hiram Van Slyke**, Coxsackie N. Y. Same on many trees and shrubs, 5 Sep.; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y.

Notolophus ? antiqua Linn., egg on apple, 11 May; from **B. D. Van Buren**, Plattsburg N. Y.

Notolophus leucostigma Abb. & Sm., white marked tussock moth, male, July; from **Mrs E. H. Mairs**, Irvington-on-Hudson N. Y. Same, female and recently laid eggs, 2 Oct.; from **M. W. Van Denburg**, Mount Vernon N. Y. Larvae were abundant the last three weeks of September, the females beginning to spin up the last week of September.

Sibine stimulea Clem., saddle back caterpillar, larvae, 24 Aug.; from **O. Q. Flint**, Athens N. Y. Same on beet leaves, 17 Sep.; from **J. B.**, Greenwich Ct.

Datana ministra Drury, yellow necked appletree caterpillar, larvae on quince, 10 Aug.; from **C. H. Peck**, Menands N. Y.

Datana integerrima Gr. & Rob., larvae on walnut, 6 Aug.; from **Washington Rodman**, Astoria N. Y. Same larvae and pupae on hickory 13 and 21 Aug.; from **B. F. Koons**, Storrs Ct. Same 31 Aug.; from **Leigh I. Holdredge**, Oneonta N. Y.

Schizura concinna Abb. & Sm., red humped apple-tree worm, larva on apple 22 July; from Mrs **H. E. Robinson**, North Nassau N. Y. Same 30 July from **H. D. Lewis**, Amundale N. Y.

Samia cecropia Linn., cecropia moth, adult, 21 June; from **Mary B. Sherman**, Ogdensburg N. Y. Same 2 July; from **Minnie Green**, Albany N. Y.

Automeris io Fabr., io moth, adult, 13 June; from **J. P. Van Ness**, East Greenbush N. Y. Same larva, 23 July; from **Harriet M. Smith**, North Hector N. Y. Same larvae on apple, 26 July; from **V. P. D. Lee**, Altamont N. Y.

Anisota senatoria Abb. & Sm., orange striped oak worm, larva dead on pin oak (*Quercus palustris*) 30 Aug.; from **L. Menand**, Albany N. Y.

Clisiocampa americana Fabr., appletree tent-caterpillar, adult, 15 July; from **W. C. Hitchcock**, Pittstown N. Y. Same, adult, July; from Mrs **E. H. Mairs**, Irvington-on-Hudson N. Y.

Clisiocampa distria Hübn., forest tent-caterpillar, larvae on apple, 11 May; from **G. F. White**, Preston Hollow N. Y. Same, larva, on elm 30 May; from **Rhoda Thompson**, Ballston Spa N. Y. Same, cocoons, 30 July; from **H. D. Lewis**, Amundale N. Y.

Tolyte laricis Fitch, larch lappet caterpillar from under a plumtree, 30 July; from **J. H. Clark**, Coldwater N. Y.

Prionoxystus robiniae Peck, oak carpenter moth, larvae in sugar maples, 1 Dec.; from **Mary B. Sherman**, Ogdensburg N. Y. Over 20 half and full grown larvae were taken from one tree. Same, larvae in ash trunk, 8 June and adults, 28 June; from **M. F. Adams**, Buffalo N. Y.

Zeuzera pyrina Fabr., leopard moth, larva in imported quince seedlings, 29 Jan.; from **C. H. Stuart**, Newark N. Y.

Mamestra picta Harr., zebra caterpillar, larvae on red raspberry, 20 June; from **F. J. Hunt**, Kendaia N. Y.

Hydroecia nitela Guen., stalk-borer, larva on raspberry, 17 July; from Mrs **H. E. Robinson**, North Nassau N. Y.

Euthisanotia grata Fabr., beautiful wood nymph, moth, 15 July; from **W. C. Hitchcock**, Pittstown N. Y.

Plusia balluea Geyer, adult, 15 July; from **W. C. Hitchcock**, Pittstown N. Y.

Plusia simplex Guen., celery plusia, larvae on celery, 14 Oct.; from **L. Balderston**, Colora Md.

Catocala amatrix Hübn., adult, 14 Sep.; from **W. C. Hitchcock**, Pittstown N. Y.

Paleacrita vernata Pack., spring canker worm, eggs, larvae on appletree, 6 May; from **J. F. Hunt**, Kendaia N. Y. The eggs were just hatching, and the living female received deposited a number of eggs.

Alsophila pometaria Harr., fall canker worm, larvae on apple, 15 May; from Mrs **A. M. A. Jackson**, Belle Isle N. Y.

Evergestis stramenalis Hübn., black headed cabbage worm, larva on turnip, 3 and 13 July; from **G. S. Graves**, Newport N. Y.

Plodia interpunctella Hübn., Indian meal moth, all stages in a box of roasted oats, 18 Feb.; from Mrs **F. J. Riggs**, Albany N. Y.

Cacoecia rosaceana Harr., oblique banded leaf-roller, adult, July; from Mrs **E. H. Mairs**, Irvington-on-Hudson N. Y. Same, larvae on maple, 6 Aug.; from **Hugh P. Blackinton**, Hoosick Falls N. Y.

Tmetocera ocellana Schiff., bud moth, larvae on apple, 15 May; from Mrs **A. M. A. Jackson**, Belle Isle N. Y.

Phoxopteris nubeculana Clem., apple leaf-folder, larva on apple, 27 Oct.; from **J. Jay Barden**, Fredonia N. Y.

Carpocapsa pomonella Linn., codling moth, larva on quince, 12 July; from **S. B. Strong**, Setauket N. Y.

Sitotroga cerealella Oliv., grain moth, all stages in a cereal, 11 Mar.; from **Albany camera club**, Albany N. Y.

Ornix geminatella Pack., mines in apple leaves, 29 Oct.; from **J. Jay Barden**, Fredonia N. Y. They were so abundant that there was scarcely a perfect leaf in the orchard.

Coleophora malivorella Riley, pistol case-bearer, larvae on appletree, 6 May; from **J. F. Hunt**, Kendaia N. Y.

Coleophora limosipennella Dup., larvae on European elm, 15 June; from **E. T. Schoonmaker**, New York N. Y.

?*Catastega aceriella* Clem., work of larvae on hard maple, 13 Aug.; from **Jeanette C. Miller**, Aldercreek N. Y.

Lithocolletis pomifoliella Zell., thorn apple leaf-miner, mines in apple leaves, 29 Oct.; from **J. Jay Barden**, Fredonia N. Y.

Bucculatrix canadensisella Cham., birch leaf Bucculatrix, larvae and pupae very abundant on birch, 3 Sep.; from **Mrs H. D. Graves**, Ausable Forks N. Y. Same, larvae on white birch, exceedingly abundant, 11 Sep.; from **Mary B. Sherman**, Ogdensburg N. Y.

Mecoptera

Panorpa confusa Westw., scorpion fly, adults taken at Sandusky O., 29 June; from **J. S. Hine**, Columbus O.

Panorpa venosa Westw., scorpion fly, adults taken at Hanging Rock O., 27 June; from **J. S. Hine**, Columbus O.

Bittacus punctiger Westw., adults, taken in District of Columbia, 18 July; from **J. S. Hine**, Columbus O.

Bittacus apicalis Uhl., adults taken at Sandusky O., 12 July; from **J. S. Hine**, Columbus O.

Neuroptera

Chauliodes pectinicornis Linn., adults, 15 July; from **W. C. Hitchcock**, Pittstown N. Y.

Corydaliscornuta Linn., horned Corydalid, adult, 5 July; from **F. S. Tinney**, Albany N. Y. Same, 10 July; from **A. T. Laird**, Albany N. Y. Same, adult, 15 July; from **A. H. Green**, Shushan N. Y. Same, adult, 15 July; from **H. D. Lewis**, Annandale N. Y.

Hemiptera

Acanthosoma cruciata? Say, last nymphal stage, on hemlock, 20 Aug.; from **Eliza S. Blunt**, summit of Mt Hurricane, N. Y.

Anasa tristis DeGeer, squash bug, eggs, adults on squash, 29 June; from Schoharie county. Same, 10 July; from **Rhoda Thompson**, Ballston Spa N. Y.? Work of same and first nymphal stage, on squash or melon, 15 Aug.; from Mrs **C. C. Woolworth**, Castleton N. Y. Nymph of same, 19 Aug.; from **George S. Graves**, Newport N. Y.

Blissus leucopterus Say, chinch bug, adult on timothy, 7 Sep.; from **James M. Graff**, Westport N. Y.

Leptopterna dolabrata Linn., adults, on wheat, 27 June; from **C. H. Stuart**, Newark N. Y.

Lygus pratensis Linn., tarnished plant bug, 8 Sep.; from Miss **Eliza S. Blunt**, New Russia N. Y.

Poecilocapsus lineatus Fabr., four lined leaf bug, adults on chrysanthemum, 26 June; from **E. T. Schoonmaker**, Cedar Hill N. Y.

Triphleps insidiosus Say, 8 Sep.; from Miss **Eliza S. Blunt**, New Russia N. Y.

Acanthia lectularia Linn., bed bug, adult, 19 Feb.; from **John Wallace**, Albany N. Y.

Phymata wolffii Stal., ambush bug, adult, 12 Aug.; from **G. A. Baily**, Cardiff N. Y.

Emesa longipes DeGeer, thread legged bug, adult, 16 Sep.; from **O. Q. Flint**, Athens N. Y.

Benacus griseus Say, giant water bug, adult, 17 June; from Mrs **M. B. Witherell**, Shushan N. Y.

Typhlocyba comes var. *vitis* Harr., grapevine leaf hopper, cast skins on grape leaves, 15 Nov.; from **Alice M. Gardner**, Fulton N. Y.

Poeciloptera septentrionalis Spin., grape Poeciloptera, adult accidentally on celery, 14 Oct.; from **L. Balderston**, Colora Md.

Ormenis pruinosa Say, lightning leaf hopper, young on pear, currant, ? plantain, 10 July; from **G. S. Clark**, Milton N. Y. Nymph of same on grape, 24 July; from **J. F. Hunt**, Kendaia N. Y.

Enchenopa binotata Say, two spotted tree hopper, adults on bittersweet, 30 July; from Dr **Henry Coffin**, Glens Falls, N. Y.

Haematopinus euryesternus Nitzs., short-nosed cattle louse, eggs and adults on cattle hairs, 6 Feb.; from Dr **C. D. Smead** Ohio.

Phylloxera caryaecaulis Fitch, hickory gall aphid, all stages in hickory galls, 8 June; from **H. N. Howe**, Bedford Station N. Y.

Phylloxera vitifoliae Fitch, grape Phylloxera, galls on grape leaves, 7 Sep.; from Miss **M. L. Williams**, Sherburne, N. Y.; adults and young of same in grape galls, 27 Sep.; from **J. Jay Barden**, Fredonia N. Y.

Pemphigus tessellatus Fitch, alder blight, on German alder (imported) and the native species 24 June; from **H. C. Peck**, Rochester N. Y.

Schizoneura americana Riley, woolly elm aphid, young and adults on American elm, 30 May; from **Rhoda Thompson**, Ballston Spa N. Y.

Phyllaphis fagi Linn., beech aphid, on red beech, 20 June; from Mrs **C. J. Gould**, Tarrytown N. Y.

Callipterus ulmifolii Monell, elm leaf aphid, exuviae on American elm, 27 June; from **M. E. Woodbridge**, Binghamton N. Y. Same 15 June; from **A. H. Wright**, Rome N. Y.

Myzus cerasi Fabr., cherry aphid, all stages on cherry, 12 June; from **C. A. Wieting**, Cobleskill N. Y.

Myzus ribis Linn., currant aphid, females on currant, 4 May; from **L. I. Holdredge**, Oneonta N. Y. Young of same, 1 June; from **J. B. Rice**, Cambridge N. Y. Same, 12 June; from **C. A. Wieting**, Cobleskill N. Y.

Chionaspis euonymi Comst., on *Celastrus scandens*, 20 Dec.; from **P. L. Husted**, Blauvelt N. Y.

Chionaspis furfura Fitch, scurfy bark louse, adults and eggs on baldwin apples (fruit), 24 Nov.; from ? **C. J. Lisk**, New Baltimore N. Y.

Chionaspis ?linteri Comst., on Cornus, 19 Mar.; from **H. C. Peck**, Rochester N. Y. Probably same, 15 Sep.; from **P. L. Husted**, Buffalo N. Y.

Chionaspis pinifoliae Fitch, pine leaf scale insect, adults on white pine needles, 30 Oct.; from **Spencer Trask**, Saratoga Springs N. Y.

Mytilaspis pomorum Bouché, appletree bark louse, eggs under scales on Pennsylvania maple, 10 Feb., eggs of same on Crataegus, 1 June, and young on apple, 8 June; all from **G. S. Graves**, Newport N. Y. Eggs of same on apple, 15 Ap.; from **C. E. Childs**, Mayfield, N. Y. 4 May; from **W. M. Phipps**, Albion N. Y. 9 May; from **Cyrus Crosby**, Cranberry Creek N. Y. Eggs of same on lilac, 9 May; from **C. A. Hall**, Oak Hill N. Y. Probably same on syringa imported from Germany, 24 June; from **H. C. Peck**, Highland park, Rochester N. Y. Same on ash, 30 Aug.; from **J. T. Gaylord**, Poughkeepsie N. Y.

Parlatoria viridis Ckll., on Japanese maple, 26 Ap.; from **H. C. Peck**, Rochester N. Y.

Aulacaspis rosae Sandb., rose scale, on blackberry, 27 Mar.; from **J. Jay Barden**, Stanley N. Y. Same with eggs, on black raspberry, 10 May; from **William Trimble**, Concordville Pa. Same on blackberry, 3 June; from Hudson N. Y.

Diaspis cacti Comst. cactus scale, all stages on night blooming cereus, *Cereus grandiflora*, 7 Nov; from **L. H. Joutel**, New York N. Y.

Aspidiotus ancyclus Putn., Putnam's scale, on nectarine and pear, 10 May; from **Edward Moore**, Loudonville N. Y. Same on apple, 24 June; from **B. D. Van Buren**, Union Springs N. Y. Same, adults and young on purple-leaved beech, 26 July; from **P. L. Husted**, Menands N. Y. Same on mountain ash, 6 Aug. from **H. C. Peck**, Rochester N. Y.

Aspidiotus forbesi Johns., cherry scale on Japan plum, 10 June; from **D. C. Lee**, Cornwall N. Y. Same on apple, 30 Aug.; from **P. L. Husted**, Crescent Station N. Y.

Aspidiotus ostreaeformis Curt., English fruit tree scale insect, on apple, 6 June; from **B. D. Van Buren**, Union Springs N. Y. Same with probably some *A. ancyclus* on currant, 15 June; from **C. H. Darrow**, Geneva N. Y. Adult female of same, on ? willow and ? plum, 16 July from **Mr Van Buren**, Scipioville N. Y. Adults and young of same on willow, 20 July, and adults of same, on Carolina poplar, 5 Aug.; from **J. Jay Barden**, Fredonia N. Y. Same on plum, 6 Aug.; from **H. C. Peck**, Rochester N. Y.

Aspidiotus perniciosus Comst., San José scale, breeding on peach, 19 Oct.; from **E. M. Wilson**, Babylon N. Y. Same on Japan plum, 27 Nov.; from **A. M. Halstead**, Rye N. Y. Young of same on plum, 25 Feb.; from **Dr Edward Moore**, Loudonville N. Y. Young of same on apple, 29 Ap.; from **J. A. Hepworth**, Marlboro N. Y. 13 July; from **L. L. Morrell**, Kinderhook N. Y. Same on Japan quince, 6 May; from **J. A. Paine**, New York N. Y. Same, half grown, on flowering prune, 8 June; from **H. N. Howe**, Bedford Station N. Y., through *Country gentleman*. Same on Japan plum, 17 June; from **L. F. Brown**, near Highland N. Y.

Aspidiotus uvae Comst., on grapevine, 26 Mar.; from **J. L. Cooper**, Nashville Tenn., through *Country gentleman*.

Asterolecanium variolosum Ratz., golden-oak scale, on white oak, 16 Sep.; from **I. O. C.**, Yonkers N. Y., through *Country gentleman*.

Lecanium cerasifex Fitch, cherry Lecanium on apple, 25 Mar.; from **M. H. Beckwith**, Elmira N. Y.

Lecanium hesperidum Linn., young and adults on fern, 22 Mar.; from **J. D. Winne**, Kingston N. Y. Same on orange, 19 Aug.; from **J. W. Knapp**, Warwick N. Y.

Lecanium ? prunastri Fonse., New York plum Lecanium, young on plum, 13 Ap.; from **M. H. Beckwith**, Elmira N. Y. 22 June; from **C. H. Darrow**, Geneva N. Y.

Gossyparia ulmi Geoff., Elm bark louse, adult on elm, 17 June; from **H. C. Peck**, Rochester N. Y.

Orthoptera

Oecanthus niveus DeGeer, white flower cricket, eggs in raspberry canes, 31 Dec.; from **C. G. Babcock**, Newport N. Y. Eggs of same in peach twigs, 7 Feb.; from **H. C. Peck**, Scottsville N. Y. Adult of same, 14 Sep.; from **W. C. Hitchcock**, Pittstown N. Y.

Microcentrum retinervis Burm., angular winged katydid, eggs, on plum, 18 June; from Austin W. Va., through **Vick publishing co.** Rochester N. Y.

Diapheromera femorata Say, walking stick, adult, 26 Oct.; from **Harry W. Riggs**, Albany N. Y.

Mantis religiosa Linn., praying mantis, 127 egg cases on grass stalks, etc., 8 Ap.; from **H. F. Atwood**, Rochester N. Y.

Ischnoptera pennsylvanica DeGeer, wood cockroach, young in decayed wood, 31 Jan.; from **Henry L. Griffis**, Newpaltz N. Y.

Nyctoboro ?holosericea Klug., young probably on bananas, 13 Ap.; from **J. M. Dolph**, Port Jervis N. Y.

Corrodentia

Psocus venosus Burm. on maple, 13 Aug.; from **B. F. Koons**, Storrs Ct.

Thysanura

Thermobia furnorum Rov., silver fish, adult among papers, etc., 5 Nov.; from **G. W. Cravens**, Schenectady N. Y.

Smynturus hortensis Fitch, garden flea, adults on melon and squash, 31 May; from **C. E. Ford**, Oneonta N. Y.

Arachnida

Phytoptus ulmi Garm., elm gall mite on American elm, 8 June; from **G. S. Graves**, Newport N. Y.

Appendix

ACCOUNT AND CATALOGUE OF THE ENTOMOLOGIC EXHIBIT AT THE PAN-AMERICAN EXPOSITION 1901

Official awards

Gold medal. Collective exhibit of insects

Silver medals. Forest and shade tree insects; entomologic technical collection; wing frame exhibit showing work of entomologist.

Several things were kept in mind in the preparation of this collection. It was designed primarily to be of the greatest possible value to all those who are obliged to control insects or suffer financial loss; and, to accomplish this, insects injurious to the different crops and to various products were given a very prominent place in the exhibit. These injurious species are also represented, so far as possible, in their different stages, egg, larva, pupa and adult, and any peculiarities of habit (specially those bearing on the character of the injury) are illustrated. Thus in looking over the exhibit of injurious forms, the visitor has before him an epitome of the life of the depre-dator. He sees not only the insect in its injurious stage but also in its other forms, and in a few moments he can grasp many of the essential facts in the life history of a pest. The illustrations of the work of the injurious species are frequently very helpful in enabling a farmer to recognize the author of what was to him previously a mysterious injury. A catalogue of the collection was also prepared, and its value much enhanced by the addition of references to the principal notices of economic groups and also of individual species, thus making it practically a reference book to the latest and most accessible accounts of the various pests represented, and, in addition to

this, brief directions are given for controlling the various forms. The enormous number of injurious insects, even in New York state, made it imperative that the exhibit should be limited to the more important forms, and that the insects selected be grouped in a manner easily comprehended by the general public; they are therefore arranged under various important food plants, etc., and each group receives special notice under an appropriate head.

There are many who are interested in insect life for other than economic reasons. Students of entomology will find much of interest in the systematic collection, in which are native representatives of all the more important families, and beginners will derive much aid in the care of their specimens from a study of the technical collection. Those attracted by the peculiar or beautiful in nature will find much of interest in the collection of the work of gall insects, in the mimicry collection and in the collection of New York beauties, the latter being an assemblage of some of the more beautiful native butterflies and moths. The wing frames and framed photographs present by means of statistics and illustrations some of the more important activities of the office. The entire exhibit can now be seen at the state museum, Albany N. Y.

Fruit tree insects (nos. 1-23). This collection of 23 different species includes some of the most important insect enemies of man, such as the codling moth, a species causing an estimated annual loss in New York state alone of about \$3,000,000, the plum curculio, appletree borers (both exceedingly destructive), rose beetle, appletree tent-caterpillar, case-bearers and others, all insects causing much loss annually to fruit growers. Many of these pests have been repeatedly noticed in the reports and bulletins issued by the state entomologist, and, for excellent accounts of individual species, the reader is referred to the citations given in the appended catalogue.

Vine and small fruit insects (nos. 24-41). This group comprises 18 of the most injurious forms depredating on the grapevine, currant, raspberry and other small fruits. One of the most important species represented is the grapevine root worm, a

beetle which has already caused considerable loss in the western part of the state and one which threatens to do much injury in the future. The grapevine flea beetle is another pest which demands special mention in this connection. The grapevine plume moth, the currant sawfly and the tarnished plant bug are all familiar in a way to many growers, and yet few comprehend fully the actual mischief they cause. Many of those included in this and following groups have been figured and briefly described in bulletin 37 of the New York state museum.

Garden insects (nos. 42-68). This group is represented by 27 species which injuriously affect one or more of the crops commonly grown in gardens. In it are found such notorious pests as wireworms, cutworms, cabbage butterfly, blister beetles, cucumber beetles, flea beetles, asparagus beetles, squash bugs, etc. Many of them are very common, and not a few are exceedingly destructive, in spite of the fact that in most cases there are a number of well-known methods of keeping these pests in control. Most of these forms are treated of in the reports of the state entomologist, and many of them in the state museum bulletin 37, cited above.

Grass and grain insects (nos. 69-83). This group contains only 15 species, but in it are represented some exceedingly destructive insects. The June beetles, or white grubs, are probably as destructive as some of the species feared much more, but, as the injury they cause is usually a constant one, it attracts little attention as a rule. The army worm outbreak of 1896 is still fresh in the minds of many, while the Hessian fly has this year caused an estimated loss in New York of \$3,000,000, or about half the crop. The chinch bug is another of the notorious enemies to prosperity, proving most injurious in the southern and western states, though in 1882 and 1883 it threatened to cause considerable loss in New York state. A very good account of this outbreak is given by the late Dr Lintner in his second report as state entomologist. A number of species of grasshoppers are also included, since they not infrequently cause great mischief in various sections of the state.

Household insects (nos. 84-99). The species represented in this group are but 16 in number, yet many a housewife would prefer to fight two or three less prolific pests, rather than any one of several which may be named in the list. Recent investigations have shown that not only is the common house fly a nuisance about the house, but also that it is a menace to the good health of the community. A reduction of its numbers is comparatively easy. The cheese skipper, noticed in detail in the 12th report of the state entomologist, is of much interest to cheese makers. The croton bug, cockroach, carpet beetles, clothes moths and other familiar pests in the home have been treated briefly by the state entomologist in the transactions of the New York state agricultural society for 1899.

Insects affecting stored food products (nos. 100-8). This small group, comprising but nine species, includes some very injurious forms. The most important are, the grain moth (a species which has caused considerable injury to wheat on Long Island and adjacent localities last year and this), the bean weevils and the cigarette beetle. Most of these insects breed readily in various dried food products and not infrequently they are sources of annoyance in the house. Most of these species have been briefly treated in bulletin 37 of the New York state museum.

Beneficial insects (nos. 109-63). This is an exceedingly important group which is represented in the collection by 55 different species. A series of forms which carry pollen from one plant to another is shown in order to emphasize this function of insects. It may well be considered as one of the most important exercised by them. A few of the many beneficial parasites and predaceous enemies of insects are included, so that the farmer and others may have some idea of the appearance of beneficial forms. The mulberry silkworm and some of its allies comprise the portion of this group devoted to species of direct value or benefit to man.

Scale insects, Coccidae (nos. 164-202). This exceedingly important group differs so widely from all other insects that its

members were brought together in one collection, that the comparative differences between them might be more easily seen. The 39 species represented include, among others, the two very common and injurious forms known as the appletree bark louse and the scurfy bark louse. The notorious San José scale insect is well represented, and its close allies, the English fruit tree scale insect, the cherry scale insect and Putnam's scale insect, also find a place in the collection. These more important enemies of fruit trees have been treated of in considerable detail and admirably illustrated in colors in bulletin 46 of the New York state museum. Another very important scale insect included here is the elm bark louse, a species which is noticed in some detail and illustrated in colors in the 5th report of the fisheries, game and forest commissioners of New York.

Forest insects (nos. 203-51). This very important group is represented in the collection by 49 species, the result mostly of recent collections made in the state. Dr A. D. Hopkins, who is a recognized authority on this subject, estimates the total annual loss caused by insects in this country in forest and forest products at the enormous sum of \$25,000,000. This is a group to which comparatively little attention had been paid in New York till the state entomologist took up the study of it several years ago. Among the more important forms represented in this collection may be mentioned the pine "sawyer," a large grub which frequently causes much injury to logs allowed to lie for some time in mill yards. A number of species of bark-borers are represented. They are of special interest, because several of them are quite injurious to soft woods in the Adirondacks, while other species are killing pine in the Hudson river valley and on Long Island. The forest tent-caterpillar, the pest which has been ravaging our hard maples in recent years, is well represented in the collection, along with some of its natural enemies. A summary account of this insect, illustrated by colored figures, has been given by the state entomologist in the 4th report of the fisheries, game and forest commissioners of New York.

Shade tree insects (nos. 252-67). This group, illustrated by 16 species, naturally comes very close to the preceding. It has been limited largely in the present instance to those species which are rarely of economic importance except when attacking shade trees; and, as these are among our most valuable assets, the group is of great economic importance. It includes such destructive pests as the sugar maple borer, leopard moth, elm bark borer, elm bark louse, elm leaf beetle, white marked tussock moth, bag worm, and others, all very injurious to highly prized shade trees. Most of them can be controlled without excessive expense. For detailed accounts of these pests the reader is referred to the New York state museum bulletins 20 and 27, to the 12th report of the state entomologist and to his papers in the 4th and 5th reports of the fisheries, game and forest commissioners of New York.

Work of gall insects (nos. 268-97). This is a small collection of deformities produced in plants by 30 species of insects belonging to three different orders. It illustrates the effect a comparatively insignificant insect may have on plant tissues, and in the study of the collection a number of interesting biologic problems are presented to the mind of the student.

Systematic collection (nos. 298-931). This assemblage of 634 species occupies nearly one third of the entire space devoted to the display of insects. It is arranged according to what are believed to be the natural affinities of the species. That is, the more closely related are put next to each other, so far as possible. There is nothing very new in the collection, but it accomplishes its object in giving the casual observer some idea of the immense number and variety of forms found in the insect world. Such a collection can make no pretense to completeness, as will be seen at once, when it is remembered that our best authorities estimate that between one and 10 million different species of insects now exist in the world. It has special value, however, to residents of New York state, since the more common native forms are very fully represented. This is of particular advantage in showing to some extent how many insects occur in a locality,

and the sight of these should serve as a stimulus to the young collector. This part of the exhibit should also aid materially in the identification of native forms by comparison. The common names of orders, families, groups and species, where well recognized ones occur, have received a prominent place, so that the nonscientific may not be discouraged by labels bearing only unfamiliar Latin names, and those who will use only scientific names, will find them readily, even though written in smaller characters. A more definite idea of this collection may be obtained by the following figures. The bee and the wasp family is represented by 67 species, beetles, by 213 species, two winged flies (Diptera) by 55 species, butterflies, by 69 species, moths, by 106 species, true bugs, by 44 species (to which should be added the 39 species of scale insects put in a special collection) and the grasshopper family, by 20 species. The smaller orders like the fleas, caddis flies, Thrips, white ants, stone flies, dragon flies, May flies, etc., are represented by relatively fewer species. This part of the exhibit contains by far the largest number of species, and, in order to get the most out of it, considerable time should be given to the groups most interesting to the individual observer.

Collection illustrating protective mimicry (nos. 932-46). This is a small lot, comprising but 15 species. It is an exceedingly pretty assemblage of insects, and, though individuals may disagree as to the method by which such interesting adaptations are brought about, no one can fail to admire the collection as a whole and to be interested in the striking illustrations of protective mimicry.

New York beauties (nos. 947-61). This small assemblage of only 15 native species was brought together for the purpose of showing some of the beautiful forms occurring in our state.

Technical collection (nos. 962-1021). This consists of over 60 different articles arranged to show the best methods and apparatus for the collection and preservation of insects. It is an exceedingly important subject to the amateur entomologist; and, as most of the articles exhibited are comparatively inexpensive, and as many homemade devices are included in the collection,

this portion of the exhibit can not fail to be of interest and of great practical value to those making collections of insects.

Framed photographs (nos. 1022-26). This series is largely historical in nature, as enlarged photographs of the two early official entomologists of the state and the residence and work building, or "bug house," of the New York pioneer in economic entomology occupy prominent places in the collection. While all of these are of importance, because the public should be interested in the features of prominent scientific men, the two latter photographs are exceedingly valuable, because they constitute a graphic record of the conditions under which the study of insects was first pursued by a New York state official.

Wing frames (1027-52). The tables and illustrations displayed on the wing frames give a general idea of the main activities of the office. Besides organization, list of publications, table of correspondence, etc., most of the wing frames are occupied with some of the more important original illustrations prepared in the office, thus giving in a graphic manner some idea of the number and variety of insects studied.

Publications. This exhibit includes all of the more important publications of the state entomologist and his predecessor, the entomologist of the New York state agricultural society. The Fitch reports, as they are commonly termed, and the reports of the state entomologist contain many detailed, illustrated notices of our most important insect pests. The entomologic bulletins of the state museum, except a few of the later ones devoted to the report of the entomologist, usually treat of a well related group and are as a rule of more service to the practical, non-entomologic person than independent notices in various reports or in separate bulletins. The reference to the more accessible, important notices of injurious insects listed in the appended catalogue should prove invaluable in directing the general public to the desired information in these reports and bulletins.

A copy of the catalogue is appended to this account and should be consulted for further information in regard to the collection.

CATALOGUE

FRUIT TREE INSECTS (1-23)

General works on the group

Fitch, Asa. Noxious and other insects of New York. 3d rep't, '56. p. 3-119.

Saunders, William. Insects injurious to fruits. Lippincott. Phila. '89. p. 1-436.

Weed, C. M. Insects and insecticides. Published by the author, Hanover N. H. '91. p. 1-281.

Smith, J. B. Economic entomology. Lippincott. Phila. '96. p. 1-481.

1 **Codling moth**, *Carpocapsa pomonella* Linn. Principal food plants: apple, pear.

Treatment: Spray with poison soon after the petals have fallen, destroy fallen fruit, trap larvae under bands.

Chief accessible articles: **Comstock, J. H.** U. S. dep't agric. Rep't, '79. p. 253-55; **Howard, L. O.** — '87. p. 88; **Lintner, J. A.**, state ent. 9th rep't, '92. p. 338-42; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 142. '98. p. 1-69; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 276-77.

2 **Bumble flower beetle**, *Euphoria inda* Linn. Principal food plants: peaches, corn.

Treatment: hand picking.

Chief accessible article: **Lintner, J. A.**, state ent. 1st rep't, '82. p. 232-39.

3 **Plum curculio**, *Conotrachelus nenuphar* Herbst. Principal food plant: plum.

Treatment: Destroy the beetles after jarring them from the trees.

Chief accessible articles: **Riley, C. V.** and **Howard, L. O.** U. S. dep't agric. Rep't, '88. p. 57; **Lintner, J. A.**, state ent. 7th rep't, '91. p. 288-96.

4 **Pear midge**, *Diplosis pyrivora* Riley. Principal food plant: pear.

Treatment: Destroy infested fruit before maggots escape.

Chief accessible articles: **Riley, C. V.** U. S. dep't agric. Rep't, '85. p. 283-89; **Lintner, J. A.**, state ent. 8th rep't, '91. p. 140-51.

5 Round-headed appletree borer, *Saperda candida* Fabr. Principal food plant: appletree.

Treatment: Dig out borers, protect trunk with paper or wire netting, use carbolic-soap washes.

Chief accessible articles: Lintner, J. A., state ent. 5th rep't, '89. p. 269-71; Chittenden, F. H. U. S. dep't agric. div. ent. Circ. 32, 2d s. '98. p. 1-8.

6 Flat-headed appletree borer, *Chrysobothris femorata* Fabr. Principal food plants: apple, pear and plum trees.

Treatment: carbolic-soap washes, digging borers out.

Chief accessible article: Chittenden, F. H. U. S. dep't agric. div. ent. Circ. 32, 2d s. '98. p. 9-12.

6a Peach tree borer, *Sanninoidea exitiosa* Say. Principal food plant: peach.

Treatment: Apply washes between June 5 and July 1 or use protective bands and supplement by digging out borers.

Chief accessible articles: Fitch, Asa. Noxious and other insects. N. Y. 1st rep't, p. 108-117; Lintner, J. A., state ent. 8th rep't, '91. p. 181-86; Slingerland, M. V. Cornell agric. exp. sta. Bul. 176, '99, p. 192.

7 Pear blight beetle, *Xyleborus dispar* Fabr. Principal food plant: peartree.

Treatment: Cut and burn infested limbs, keep trees vigorous.

Chief accessible articles: Lintner, J. A., state ent. 7th rep't, '91. p. 348-51; Hubbard, H. G. U. S. dep't agric. div. ent. Bul. 7, n. s. '97. p. 22-23.

8 Fruit tree bark beetle, *Scolytus rugulosus* Ratz. Principal food plants: peach, plum, cherry trees.

Treatment: Cut and burn badly infested limbs, keep trees vigorous.

Chief accessible articles: Lintner, J. A., state ent. 4th rep't, '88. p. 103-7; Chittenden, F. H. U. S. dep't agric. div. ent. Circ. 29, 2d s. '98. p. 1-8.

9 Rose beetle, *Macrodactylus subspinosus* Fabr. Principal food plants: fruit trees and rosebushes.

Treatment: Spray beetles with whale oil soap, $\frac{1}{2}$ pound to 1 gallon water, dust plants with plaster, ashes, etc.; hand picking.

Chief accessible articles: **Lintner, J. A.**, state ent. 1st rep't, '82. p. 227-32; **Chittenden, F. H.** U. S. dep't agric. div. ent. Circ. 11, 2d s. '95. p. 1-4; **Marlatt, C. L.** U. S. dep't agric. Yearbook. '95. p. 396-98.

10 **Appletree tent-caterpillar**, *Clisioecampa americana* Fabr. Principal food plants: wild cherry, appletrees.

Treatment: Collect and destroy egg belts, kill young while in nests, spray with poison in early spring.

Chief accessible articles: **Felt, E. P.**, state ent. 14th rep't (N. Y. state mus. Bul. 23). '98. p. 177-90; N. Y. state mus. Bul. 27. '99. p. 46-48; **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 152. '98. p. 281-93; **Beach, Lowe and Stewart.** N. Y. agric. exp. sta. Bul. 170. '99. p. 389-90; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 271-72.

11 **Pimpla conquisitor** Say, a parasite on the above.

12 **Gipsy moth**, *Porthetria dispar* Linn. Principal food plants: fruit, oak, maple and other forest trees.

Treatment: Collect and destroy eggs, kill clustered larvae, spray with arsenate of lead.

Chief accessible articles: **Fernald, C. H.** Mass. (Hatch) agric. exp. sta. Special bul. Nov. '89. p. 1-8; **Forbush, E. H.**, and **Fernald, C. H.** Mass. state board agric. Rept's 1892-1900; **Lintner, J. A.**, state ent. 9th rep't, '92. p. 420-26; **Howard, L. O.** U. S. dep't agric. div. ent. Bul. 11, n. s. '97. p. 1-39; **Forbush, E. H.** U. S. dep't agric. div. ent. Bul. 20, n. s. '99. p. 104-7; **Felt, E. P.**, state ent. 16th rep't, '00 (N. Y. state mus. Bul. 36). p. 955-62.

13 **Brown tail moth**, *Euproctis chrysorrhoea* Linn. Principal food plants: pear, apple, quince.

Treatment: Cut and burn winter nests, spray trees with poison.

Chief accessible articles: **Fernald, C. H.**, and **Kirkland, A. H.** Mass. (Hatch) agric. exp. sta. Special bul. July '97. p. 1-15; U. S. dep't agric. div. ent. Bul. 17, n. s. '98. p. 24-32.

14 **Palmer worm**, *Ypsolophus pometellus* Harris.
Principal food plant: appletree.

Treatment: Spray with poison in early June.

Chief accessible articles: **Fitch, Asa.** Noxious, and beneficial insects N. Y. 1st-2d rep'ts, '56. p. 221-33; **Lowe, V. H.** Rural New Yorker, July 14, '00. 59: 477-78; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 187. '00. p. 81-101; **Felt, E. P.**, state ent. 16th rep't, '00. p. 962-66.

15 **Oblique banded leaf-roller**, *Cacoecia rosaceana* Harris. Principal food plant: appletree.

Treatment: Spray early with poison.

Chief accessible notice: **Lintner, J. A.**, state ent. 12th rep't, '96. p. 312.

16 **Apple leaf-folder**, *Phoxopteris nubeculana* Clem. Principal food plant: appletree.

Treatment: Burn infested leaves.

Chief accessible article: **Riley, C. V.** U. S. dep't agric. Rep't, '78. p. 34-35.

17 **Pistol case-bearer**, *Coleophora malivorella* Riley. Principal food plant: appletree.

Treatment: Spray thoroughly with poison in early spring.

Chief accessible articles: **Riley, C. V.** U. S. dep't agric. Rep't, '78. p. 48-49; **Lintner, J. A.**, state ent. 1st rep't, '82. p. 163-67; **Lowe, V. H.** N. Y. state agric. soc. Trans. '96. p. 352-61; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 124. '97. p. 1-16; **Hall, F. H.** N. Y. agric. exp. sta. Bul. 122. '97. p. 1-5; **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 122. '97. p. 221-31.

18 **Cigar case-bearer**, *Coleophora fletcherella* Fern. Principal food plants: apple.

Treatment: Spray thoroughly with poison in early spring.

Chief accessible articles: **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 93. '95. p. 214-30; **Beach, Lowe and Stewart,** N. Y. agric. exp. sta. Bul. 170. '99. p. 391-92.

19 **Apple leaf-miner**, *Tischeria malifoliella* Clem. Principal food plant: appletree.

Treatment: Burn infested leaves.

Chief accessible article: **Lintner, J. A.**, state ent. 11th rep't. '95. p. 160-62.

20 **Resplendent shield-bearer**, *Aspidisca splendoriferella* Clem. Principal food plant: appletree.

Treatment: Spray in winter or early spring with contact insecticides.

Chief accessible article: **Comstock, J. H.** U. S. dep't agric. Rep't, '79. p. 210-13.

21 **Apple leaf Bucculatrix**, *Bucculatrix pomifoliella* Clem. Principal food plant: appletree.

Treatment: Spray with poison in early June.

Chief accessible article: **Lintner, J. A.**, state ent. 1st rep't. '82. p. 157-62.

22 **Bud moth**, *Tmetocera ocellana* Schiff. Principal food plant: appletree.

Treatment: Spray with poison in early spring.

Chief accessible articles: **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 50. '93. p. 1-29; ——— ——— Bul. 107. '96. p. 57-66; **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 136. '97. p. 397-98.

23 **Pear psylla**, *Psylla pyricola* Forst. Principal food plant: pear tree.

Treatment: Spray with kerosene emulsion in early spring.

Chief accessible articles: **Lintner, J. A.**, state ent. 9th rep't, '92. p. 317-29; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 44. '92. p. 161-86; ——— ——— Bul. 108. '96. p. 69-81; **Marlatt, C. L.** U. S. dep't agric. div. ent. Circ. 7, 2d s. '95. p. 1-8.

VINE AND SMALL FRUIT INSECTS (24-41)

For general works, see those cited under fruit tree insects.

24 **Grapevine root worm**, *Fidia viticida* Walsh. Principal food plant: grapevine.

Treatment: Spray with poison the latter part of June; keep soil pulverized and mounded about the base of vines in July.

Chief accessible articles: **Webster, F. M. O.** agric. exp. sta. Bul. 62. '95 p. 77-95; **Marlatt, C. L.** U. S. dep't agric. Yearbook. '95. p. 391-93; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 184. '00. p. 21-32.

25 **Spotted grapevine beetle**, *Pelidnota punctata* Linn.
Principal food plant: grapevine.

Treatment: hand picking.

Chief accessible notice: **Felt, E. P.** N. Y. state mus. Bul. 37.
'00. p. 15.

26 **Light-loving grapevine beetle**, *Anomala lucicola*
Fabr. Principal food plant: grapevine.

Treatment: hand picking, dusting vines with ashes, plaster,
etc.

Chief accessible article: **Lintner, J. A.**, state ent. 10th rep't
'94. p. 408-10.

27 **Grapevine flea beetle**, *Haltica chalybea* Ill. Principal
food plant: grapevine.

Treatment: Spray vines with poison.

Chief accessible articles: **Comstock, J. H.** U. S. dep't agric. rep't,
'79. p. 213-16; **Marlatt, C. L.** U. S. dep't agric. Yearbook. '95.
p. 395-96; **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 150. '98. p. 263-65;
Slingerland, M. V. Cornell agric. exp. sta. Bul. 157. '98. p. 189-213.

28 **8 spotted forester**, *Alypia octomaculata* Fabr.
Principal food plants: Virginia creeper, grapevine.

Treatment: Spray with arsenical poisons.

Chief accessible article: **Lintner, J. A.**, state ent. 5th rep't, '89.
p. 179-83.

29 **Grapevine plume moth**, *Oxyptilus periscelidactylus*
Fitch. Principal food plant: grapevine.

Treatment: hand picking; spray with poison.

Chief accessible articles: **Fitch, Asa.** Noxious, beneficial insects
N. Y. 1st-2d rep'ts, '56. p. 139-43; **Lintner, J. A.**, state ent. 12th
rep't, '96. p. 218-22.

30 **Grapevine leaf-hopper**, *Typhlocyba comes* Say.
Principal food plant: grapevine.

Treatment: Burn rubbish in fall or spring, early spray with
kerosene emulsion.

Chief accessible article: **Marlatt, C. L.** U. S. dep't agric. Year-
book. '95. p. 400-2.

31 Currant stem-borer, *Sesia tipuliformis* Linn. Principal food plant: currant.

Treatment: Cut and burn infested stems.

32 Red-breasted currant borer, *Tenthredo rufopectus* Nort. Principal food plant: currant.

Treatment: Cut and burn wilting tips.

Chief accessible article: **Lintner, J. A.**, state ent. 13th rep't, '97. p. 335-37.

33 Currant sawfly, *Pteronus ribesii* Scop. Principal food plant: currant.

Treatment: Spray foliage with hellebore or an arsenical poison.

Chief accessible articles: **Fitch, Asa.** Noxious, beneficial insects N. Y. 12th rep't, '67. p. 909-32; **Lintner, J. A.**, state ent. 2d rep't, '85. p. 217-21.

34 Currant spanworm, *Diastictis ribearia* Fitch. Principal food plant: currant.

Treatment: Spray foliage with an arsenical poison.

Chief accessible notices: **Lintner, J. A.**, state ent. 12th rep't, '96. p. 310-11; **Felt, E. P.** N. Y. state mus. Bul. 37. '00. p. 13-14.

35 Tarnished plant bug, *Lygus pratensis* Linn. Principal food plant: peachtree.

Treatment: hand picking, dusting with ashes, clean culture.

Chief accessible article: **Lintner, J. A.**, state ent. 13th rep't, '97. p. 351-57.

36 4 lined leaf bug, *Poecilocapsus lineatus* Fabr. Principal food plant: currant.

Treatment: Spray young with kerosene emulsion, cut and burn egg-bearing twigs.

Chief accessible articles: **Lintner, J. A.**, state ent. 1st rep't, '82. p. 271-81; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 58. '93. p. 207-39.

37 Gouty gall beetle, *Agrilus ruficollis* Fabr. Principal food plant: raspberry.

Treatment: Cut and burn infested canes in early spring.

Chief accessible articles: **Lintner, J. A.**, state ent. 6th rep't, '90. p. 123-25; ——— 10th rep't, '94. p. 406-7.

38 **White flower cricket**, *Oecanthus niveus* DeG. Principal injury to raspberry bushes.

Treatment: Cut and burn infested canes in early spring. Clean culture.

39 **Fuller's rose beetle**, *Aramigus fulleri* Horn. Principal food plant: rosebush.

Treatment: hand picking.

Chief accessible article: **Lintner, J. A.**, state ent. 2d rep't, '85. p. 142-44.

40 **Thyreus abbotii** Swains. Principal food plants: grapevine, Virginia creeper.

Treatment: hand picking.

Chief accessible article: **Cooley, R. A.** Mass agric. exp. sta. Bul. 36. '96. p. 11-12.

41 **Cranberry worm**, *Rhopobota vacciniana* Pack. Principal food plant: cranberry.

Treatment: Flow bogs after eggs hatch, spray vines with arsenical poisons.

Chief accessible articles: **Smith, J. B.** N. J. agric. exp. sta. Special bul. K. '90. p. 10-15; **Fernald, C. H.** Mass. (Hatch) exp. sta. Bul. 19. '92. p. 135-37; — Mass. state board agric. Rep't, '97. p. 145-48.

GARDEN INSECTS (42-68)

For general works, see last two publications cited under Fruit tree insects, p. 833.

42 **Wheat wireworm**, *Agriotes maneus* Say. This insect and its allies may injure a number of garden crops.

Treatment: Fall plowing; use poisoned baits for beetles.

Chief accessible articles: **Comstock, J. H.**, and **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 33. '91. p. 251-58; — — — Bul. 107. '96. p. 51-52.

43 **Cabbage butterfly**, *Pieris rapae* Linn. Principal food plant: cabbage.

Treatment: Spray young plants with arsenical poisons, use hellebore or pyrethrum on older ones.

Chief accessible notice: **Felt, E. P.** N. Y. state mus. Bul. 37. '00. p. 29-30.

44 **Zebra caterpillar**, *Mamestra picta* Harr. Principal food plant: cabbage.

Treatment: Spray young plants with arsenical poisons, use pyrethrum or hellebore on older ones.

Chief accessible articles: Lintner, J. A., state ent. 5th rep't, '89. p. 206-10; Felt, E. P., state ent. 14th rep't, '98. p. 201-7.

45 *Microplitis mamestrae*, Weed, a parasite of the preceding.

46 **Variegated cutworm**, *Peridroma saucia* Hübn. Principal food plants: a number of garden crops.

Treatment: poisoned baits.

Chief accessible article: Lintner, J. A., state ent. 5th rep't, '89. p. 200-6.

47 **Colorado potato beetle**, *Doryphora 10-lineata* Say. Principal food plant: potato.

Treatment: Spray with arsenical poisons, hand picking.

48 *Lebia grandis* Hentz. This species preys on the preceding.

49 **Spined soldier bug**, *Podisus spinosus* Dall. Another predaceous enemy of 47.

50 **Margined blister beetle**, *Epicauta cinerea* Forst. Principal food plant: frequently injures potatoes.

Treatment: Dust vines with ashes, plaster, etc., spray with arsenical poisons only when necessary, as the young are beneficial.

Chief accessible article: Lintner, J. A., state ent. 6th rep't, '90. p. 134-35.

51 **Striped blister beetle**, *Epicauta vittata* Fabr. Principal food plant: frequently injures potatoes.

Treatment: Same as preceding.

Chief accessible article: Lintner, J. A., state ent. 6th rep't, '90. p. 132-34.

52 **Stalk-borer**, *Hydroecia nitela* Guen. Principal food plants: tomato, potato and other thick stalked plants.

Treatment: Destroy caterpillars in wilting stalks.

Chief accessible article: Lintner, J. A., state ent. 1st rep't, '82. p. 110-16.

53 **Tomato worm**, *Phlegthontius celeus* Hübn.
Principal food plant: tomato.

Treatment: Spray with arsenical poisons before fruit appears, hand picking.

Chief accessible article: **Howard, L. O.** U. S. dep't agric. Year-book. '98. p. 128-32.

54 **Striped cucumber beetle**, *Diabrotica vittata* Fabr.
Principal food plant: cucumber vines.

Treatment: Spray vines with poisoned bordeaux mixture, dust vines with ashes, plaster, etc.

Chief accessible articles: **Chittenden, F. H.** U. S. dep't agric. div. ent. Circ. 31, 2d s. '98. p. 1-7; **Sirrinc, F. A.** N. Y. agric. exp. sta. Bul. 158. '99. p. 1-32.

55 **Squash vine borer**, *Melittia satyriniformis* Hübn. Principal food plant: squash vines.

Treatment: Plant early squashes as a trap crop, cut out and destroy borers.

Chief accessible article: **Lintner, J. A.**, state ent. 2d rep't, '85. p. 57-68; **Sirrinc, F. A.** N. Y. agric. exp. sta. 15th rep't, '96. p. 610-12; **Chittenden, F. H.** U. S. dep't agric. div. ent. Circ. 38, 2d s. '99. p. 1-6; — — — Bul. 19, n. s. '99. p. 34-40.

56 **Cucumber flea beetle**, *Epitrix cucumeris* Harris.
Principal food plants: cucumbers, potatoes, tomatoes.

Treatment: Spray plants with poisoned bordeaux mixture, dust with ashes, plaster, etc.

Chief accessible article: **Stewart, F. C.** N. Y. agric. exp. sta. Bul. 113. '96. p. 311-17.

57 **Red-headed flea beetle**, *Systema frontalis* Fabr.
Principal injury recorded was to sugar beets.

Treatment: Spray plants with arsenical poisons, the poisoned bordeaux mixture being specially effective.

Chief accessible notice: **Felt, E. P.**, state ent. 15th rep't, '00. p. 538.

58 **Common asparagus beetle**, *Crioceris asparagi* Linn.
Principal food plant: asparagus.

Treatment: spray all except cutting beds with an arsenical poison, dust plants with plaster, ashes, etc.

Chief accessible articles: **Lintner, J. A.**, state ent. 1st rep't, '82. p. 239-46; — 11th rep't, '95. p. 177-81; **Chittenden, F. H.** U. S. dep't agric. Yearbook. '96. p. 342-49; **Felt, E. P.**, state ent. 15th rep't, '00. p. 540-41.

59 **12 spotted asparagus beetle**, *Crioceris 12-punctata* Linn. Principal food plant: asparagus.

Treatment: same as for the preceding species.

Chief accessible articles: **Lintner, J. A.**, state ent. 12th rep't, '96. p. 248-52; **Chittenden, F. H.** U. S. dep't agric. Yearbook. '96. p. 349-52; **Felt, E. P.**, state ent. 15th rep't, '00. p. 540-41.

60 **Squash bug**, *Anasa tristis* DeG. Principal food plant: squash vine.

Treatment: Trap under chips and destroy the bugs, collect and destroy the eggs.

Chief accessible articles: **Chittenden, F. H.** U. S. dep't agric. div. ent. Bul. 19, n. s. '99. p. 20-28; — — Circ. 39, 2d s. '99. p. 1-5.

61 **Onion thrips**, *Thrips tabaci* Lind. Principal food plants: onion, lettuce.

Treatment: Spray affected plants with kerosene emulsion or whale oil soap solution.

Chief accessible article: **Lintner, J. A.**, state ent. 11th rep't, '95. p. 241-47.

62 **Rhubarb cureulio**, *Lixus concavus* Say. Principal food plant: rhubarb.

Treatment: hand picking.

Chief accessible article: **Chittenden, F. H.** U. S. dep't agric. div. ent. Bul. 23, n. s. '00. p. 61-69.

63 **Chrysanthemum fly**, *Phytomyza chrysanthemi* Kow. Principal food plant: chrysanthemum.

Treatment: Destroy infested leaves.

Chief accessible articles: **Lintner, J. A.**, state ent. 4th rep't, '88. p. 73-80; — 7th rep't, '91. p. 242-46.

64 **Mushroom phora**, *Phora agarici* Lintn. Principal food plant: mushrooms.

Treatment: Kill flies with dry pyrethrum.

Chief accessible article: **Lintner, J. A.**, state ent. 10th rep't, '94. p. 399-405.

65 **Manure fly**, *Sciara coprophila* Lintn. Principal food: decaying vegetable matter, rarely injurious.

Treatment: Spray soil with kerosene emulsion and follow with a sprinkling of water.

Chief accessible articles: **Lintner, J. A.**, state ent. 10th rep't, '94. p. 391-97.

66 **Wild parsnip worm**, *Depressaria heracliana* DeG. Principal food plant: wild parsnip, and the species therefore can hardly be considered injurious.

67 **Genista caterpillar**, *Mecyna reversalis* Guen. Principal food plant: Genista and Cytisus.

Treatment: Spray infested plants with hellebore or an arsenical poison.

Chief accessible article: **Lintner, J. A.**, state ent. 11th rep't, '95. p. 142-45.

68 **Milkweed butterfly**, *Anosia plexippus* Linn. Principal food plant: common milkweed. This is a common but not an injurious species.

GRASS AND GRAIN INSECTS (69-83)

For general works, see last two publications cited under Fruit tree insects, p. 833.

69 **May beetle**, *Lachnosterna fusca* Frohl. Principal food plant: grass roots.

Treatment: Spray infested areas heavily with kerosene emulsion just before a rain or follow spraying with a liberal watering.

Chief accessible article: **Lintner, J. A.**, state ent. 9th rep't, '92. p. 353-57.

70 **Green June beetle**, *Allorhina nitida* Linn. Principal food plant: decomposing vegetable matter and possibly grass roots to some extent.

Treatment: same as for the preceding, also poisoned bran mash.

Chief accessible article: **Howard, L. O.** U. S. dep't agric. div. ent. Bul. 10, n. s. '98. p. 20-26.

71 **Punctured clover leaf weevil**, *Phytonomus punctatus* Fabr. Principal food plant: clover.

Treatment: Plow under badly infested fields.

Chief accessible articles: **Lintner, J. A.**, state ent. 1st rep't, '82 p. 247-53; — 5th rep't, '89. p. 272-73; — 7th rep't, '91. p. 315-16.

72 *Phytonomus nigrirostris* Fabr. Principal food plant: clover; it is not a species of much economic importance.

73 **Army worm**, *Leucania unipuncta* Haw. Principal food plants: grass and grains.

Treatment: clean culture, debarring from infested fields, poisoned bran mash.

Chief accessible articles: **Lintner, J. A.**, state ent. 11th rep't, '96. p. 190-214; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 133. '97. p. 233-58; **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 104. '96. p. 122-29; — 15th rep't, '96. p. 583-605.

74 **Clover hay caterpillar**, *Pyralis costalis* Fabr. Principal food plant: clover.

Treatment: Keep hay clean and dry, salt lower layers, do not allow old hay to remain over from year to year.

Chief accessible article: **Lintner, J. A.**, state ent. 11th rep't, '95. p. 145-51.

75 **Hessian fly**, *Cecidomyia destructor* Say. Chief food plant: wheat.

Treatment: Late planting in connection with early sown decoy strips to be plowed under in late fall; grow resistant varieties, cut straw high in infested districts and burn stubble.

Chief accessible articles: **Fitch, Asa.** Noxious, beneficial insects N. Y. 7th rep't, '62. p. 133-44; **Marlatt, C. L.** U. S. dep't agric. div. ent. Circ. 14, 2d s. '95. p. 1-4; **Osborn, Herbert.** U. S. dep't agric. div. ent. Bul. 16, n. s. '98. p. 1-57.

76 **Jointworm**, *Isosoma hordei* Harr. Principal food plant: barley.

Treatment: Burn infested straw.

Chief accessible articles: **Fitch, Asa.** Noxious, beneficial insects N. Y. 7th rep't, '62. p. 155-59; **Lintner, J. A.**, state ent. 4th rep't, '88. p. 27-35.

77 *Isosoma grande* Riley. Principal food plant: wheat.

Treatment: same as preceding.

Chief accessible articles: **Riley, C. V.** U. S. dep't agric. Rep't, '84. p. 357-58; **Webster, F. M.** U. S. dep't agric. Rep't, '84. p. 383-87; ———, Rep't, '85. p. 311-15; **Riley, C. V.** U. S. dep't agric. Rep't, '86. p. 542-46.

78 Chinch bug, *Blissus leucopterus* Say. Principal food plants: grasses, small grains, corn.

Treatment: Burn grass, etc. sheltering hibernating bugs, sow decoy plots, plow badly infested areas or spray with kerosene emulsion, protect cultivated crops by barriers.

Chief accessible articles: **Lintner, J. A.**, state ent. 2d rep't, '85. p. 148-64; **Webster, F. M.** U. S. dep't agric. div. ent. Bul. 15, n. s. '98. p. 1-82.

79 Red-legged locust, *Melanoplus femur-rubrum* DeG. Principal food plants: grasses and grains.

Treatment: Plow young hoppers under, collect with hopper-dozer; poisoned bran mash.

Chief accessible article: **Lintner, J. A.**, state ent. 10th rep't, '94. p. 439-45.

80 *Melanoplus femoratus* Burm. Same as 79.

81 Pellucid locust, *Camnula pellucida* Scudd. Same as 79.

82 Carolina locust, *Dissosteira carolina* Linn. Same as 79.

83 *Circotettix verruculatus* Scudd. Same as 79.

HOUSEHOLD INSECTS (84-99)

84 Little red ant, *Monomorium pharaonis* Linn. Principal food: sweets, lard, etc.

Treatment: Destroy nests with carbon bisulfid, kerosene emulsion or boiling water, trap with lard or sponge dipped in sweetened water and destroy.

Chief accessible articles: **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 95-99; ——— Circ. 34, 2d s. '98. p. 1-4; **Lintner, J. A.**, state ent. 11th rep't, '95. p. 109-14; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59:298-99.

85 **Large black ant**, *Camponotus pennsylvanica* Cress. Bores in wood and is occasionally found in houses.

Treatment: same as for 84, so far as practicable.

86 **House fly**, *Musca domestica* Linn. Principal food: a very general feeder.

Treatment: keep premises clean and prevent the flies from getting at manure. Exclude with screens.

Chief accessible articles: **Howard, L. O.**, and **Marlatt, C. L.** U. S. dep't. agric. div. ent. Bul. 4, n. s. '96 p. 43-47; **Howard, L. O.** U. S. dep't agric. div. ent. Circ. 35, 2d s. '98. p. 1-8; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59:295-96.

87 **Cheese skipper**, *Piophilacasei* Linn. Principal food: cheese, ham.

Treatment: Exclude flies, keep affected products in darkness, destroy eggs every few days.

Chief accessible articles: **Howard, L. O.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 102-4; **Lintner, J. A.**, state ent. 12th rep't, '96. p. 229-34; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59:300-1.

88 **Larder beetle**, *Dermestes lardarius* Linn. Principal food: bacon, dried meat, skins, etc.

Treatment: Keep the beetles away by using screens or tight receptacles, clean up frequently, and give the pest little opportunity to breed.

Chief accessible articles: **Lintner, J. A.**, state ent. 6th rep't, '90. p. 119-23; **Howard, L. O.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 107-9; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 300.

89 **Croton bug**, *Phyllodromia germanica* Fabr. Principal food: a very general feeder.

Treatment: Cleanliness and the use of a roach poison, such as Hooper's fatal food; fumigate with sulfur, entice the insects to enter vessels partly filled with stale beer, from which no escape is provided.

Chief accessible articles: **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 90-95; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 229.

90 **Cockroach**, *Periplaneta orientalis* Linn. Principal food: a very general feeder.

Treatment: same as for 89.

Chief accessible articles: **Marlatt, C. L.** U. S. dep't. agric. div. ent. Bul. 4, n. s. '96. p. 90-95; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 299.

91 **Black carpet beetle**, *Attagenus piceus* Oliv. Principal food: woolens, horn, dried animal matter.

Treatment: Use rugs or matting in place of carpet whenever possible. Infested carpets should be taken up and sprayed with benzine, and the cracks in the floor should be filled with plaster before relaying. Clean garments and furs thoroughly and store during the summer in tight boxes. Fumigate infested apartments with sulfur.

Chief accessible articles: **Lintner, J. A.**, state ent. 2d rep't, '85. p. 46-48; — 9th rep't, '92. p. 299-306; **Howard, L. O.**, and **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 61-63; **Chittenden, F. H.** U. S. dep't agric. div. ent. Bul. 8, n. s. '97. p. 15-19; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 297-98.

92 **Buffalo carpet beetle**, *Anthrenus scrophulariae* Linn. Principal food: woolens, dried animal matter.

Treatment: same as for 91.

Chief accessible articles: **Lintner, J. A.**, state ent. 9th rep't, '92. p. 299-306; **Howard, L. O.**, and **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 58-60; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 297-98.

93 **Two spotted ladybug**, *Adalia bipunctata* Linn. Food: Preys on other insects and is therefore beneficial, though it is frequently mistaken for a carpet beetle.

Treatment: Always protect the beetles.

Chief accessible articles: **Lintner, J. A.**, state ent. 9th rep't, '92. p. 300; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 297.

94 **Museum pest**, *Anthrenus verbasci* Linn. Principal food: dried animal matter.

Treatment: Exclude from collections by using tight boxes, and supplement by frequent examinations, fumigate infested boxes with carbon bisulfid.

Chief accessible article: **Chittenden, F. H.** U. S. dep't agric. div. ent. Bul. 8, n. s. '97. p. 22-23.

95 **Clothes moth**, *Tineola biselliella* Hum. Principal food: woolens.

Treatment: same as for 91.

Chief accessible articles: **Marlatt, C. L.** U. S. dep't agric. div. ent. Circ. 36, 2d s. '98. p. 1-8; **Howard, L. O.**, and **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 63-69; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 297-98.

96 **Silver fish**, *Thermobia furnorum* Rov. Principal food: farinaceous matter.

Treatment: Keep things dry and do not allow them to remain undisturbed for long periods, dust haunts with pyrethrum powder.

Chief accessible articles: **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 76-78; **Felt, E. P.**, state ent. 14th rep't, '98. p. 216-18; — N. Y. state agric. soc. Trans. '99. 59: 301.

97 **Bedbug**, *Acanthia lectularia* Linn. Principal food: blood of certain mammalia.

Treatment: Apply benzin, kerosene, other petroleum oil or corrosive sublimate to crevices in infested beds. Fumigation with sulfur is valuable wherever possible.

Chief accessible articles: **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 32-38; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 299-300.

98 **Masked bedbug hunter**: kissing bug, *Opsicometus personatus* Linn. Principal food: other insects; only occasionally does it attack man.

Treatment: Exclude from houses by the use of screens.

Chief accessible articles: **Howard, L. O.** Popular science monthly, Nov. '99; — U. S. dep't agric. div. ent. Bul. 22. '00. p. 24-25.

99 **Squash bug**, *Anasa tristis* DeG. Resembles 98 somewhat, but on comparison a marked difference will be seen.

INSECTS AFFECTING STORED FOOD PRODUCTS (100-8)

100 **Rice weevil**, *Calandra oryzae* Linn. Principal food: rice or its preparations.

Treatment: Fumigate with carbon bisulfid.

Chief accessible article: Chittenden, F. H. U. S. dep't agric. Yearbook. '94. p. 280-81.

101 **Pteromalus calandrae** How., a parasite of 100.

102 **Grain moth**, *Sitotroga cerealella* Oliv. Principal food: corn, wheat.

Treatment: Harvest and thresh grain early, fumigate infested grain with carbon bisulfid.

Chief accessible articles: Lintner, J. A., state ent. 2d rep't, '85. p. 102-10; ——— 10th rep't, '94. p. 377-86; Chittenden, F. H. U. S. dep't agric. Yearbook. '94. p. 281-83.

103 **Corn Silvanus**, *Silvanus surinamensis* Linn. Principal food: cereal grains.

Treatment: Fumigate infested materials with carbon bisulfid.

Chief accessible articles: Chittenden, F. H. U. S. dep't agric. Yearbook. '94. p. 287.

104 **Meal worm**, *Tenebrio molitor* Linn. Principal food: corn and rye-meal.

Treatment: Fumigate infested meal with carbon bisulfid.

Chief accessible articles: Lintner, J. A., state ent. 8th rep't, '91. p. 176-77; Chittenden, F. H. U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 116-17.

105 **Bean weevil**, *Bruchus obtectus* Say. Principal food: beans.

Treatment: Fumigate infested seeds with carbon bisulfid.

Chief accessible article: Lintner, J. A., state ent. 7th rep't, '91. p. 255-79.

106 **Pea weevil**, *Bruchus pisorum* Linn. Principal food: pea.

Treatment: Early planting; fumigat  infested peas with carbon bisulfid.

Chief accessible article: Riley, C. V., and Howard, L. O. Insect life. '91. 4: 297-99.

107 **Confused flour beetle**, *Tribolium confusum* Duv.
Principal food: Farinaceous preparations.

Treatment: Fumigate infested preparations with carbon bisulfid.

Chief accessible articles: Chittenden, F. H. U. S. dep't agric. Yearbook. '94. p. 288-89; — — div. ent. Bul. 4. '96. p. 113-15.

108 **Cigarette beetle**, *Lasioderma testaceum* Duft.
Principal food: tobacco preparations.

Treatment: Fumigate infested substances with carbon bisulfid, exclude the insects by using tight packages.

Chief accessible article: Chittenden, F. H. U. S. dep't agric. div. ent. Bul. 4. n. s. '96. p. 126-27.

BENEFICIAL INSECTS (109-63)

Pollen-carriers

These insects perform a most important function, because many fruit trees depend very largely on insects for the carrying of pollen from flower to flower.

109 **Honey bee**, *Apis mellifica* Linn. This insect is exceedingly valuable as a pollinizer of plants as well as a producer of honey.

Bumblebees, *Bombus*

This genus is represented by a number of species, all valuable as pollen-carriers.

110 *Bombus fervidus* Fabr.

111 *B. pennsylvanicus* DeG.

112 *B. terricola* Kirby

113 *B. ternarius* Say

114 *B. vagans* Smith

115 *B. virginicus* Oliv.

116 *Melissodes obliqua* Say

117 *M. perplexa* Cress.

Leaf-cutter bees, Megachile

The popular name comes from the peculiar habit certain species, at least, have of cutting bits out of leaves to use in nest building.

118 *Megachile montivaga* Cress.

119 *M. latimanus* Say

120 *Andrena crataegi* Rob.

121 *A. fimbriata* Smith

122 *Agapostemon radiatus* Say

123 *Halictus parallelus* Say

124 **Wasp**, *Polistes pallipes* St Farg.

125 *Vespa arenaria* Fabr.

126 **Yellow jacket**, *Vespa diabolica* Sauss.

127 **White-faced hornet**, *Vespa maculata* Linn.

Flower flies; syrphus flies, Syrphidae

128 *Spilomyia fusca* Loew

129 *Helophilus latifrons* Loew

130 *H. similis* Macq.

131 *Eristalis flavipes* Walk.

132 *E. tenax* Linn.

132a *Tropidopria conica* Fabr., a parasite of the above.

133 *Eristalis transversus* Wied.

134 *Volucella evecta* Walk.

Parasites

A number of serious insect pests are held in check by parasitic enemies. These beneficial species should be protected, and in fighting insects the destruction of parasites should be avoided whenever possible.

135 *Pteromalus vanessae* How.

136 *Pimpla conquisitor* Say

137 *Ophion purgatum* Say

138 *Ichneumon flavicornis* Cr.

139 **Red-tailed tachina fly**, *Winthemia 4-pustulata* Fabr.

Predaceous insects

Some predaceous insects are most efficient aids in controlling insect depredations. The syrphid flies and ladybugs are examples of well known enemies of plant lice.

- 140 Potter wasp, *Eumenes fraternus* Say
- 141 Digger wasp, *Bembex fasciata* Fabr.
- 142 *Sphaerophoria cylindrica* Say
- 143 *Syrphus ribesii* Linn.
- 144 Margined soldier beetle, *Chauliognathus marginatus* Fabr.
- 145 Pennsylvania soldier beetle, *Chauliognathus pennsylvanicus* DeG.

Ladybugs, Coccinellidae

Plant lice or aphids find some of their most serious enemies in this group.

- 146 *Brachyacantha ursina* Fabr.
- 147 Twice-stabbed ladybug, *Chilocorus bivulnerus* Muls.
- 148 15 spotted ladybug, *Anatis ocellata* Linn.
- 149 Two spotted ladybug, *Adalia bipunctata* Linn.
- 150 *Coccinella sanguinea* Linn.
- 151 Transverse ladybug, *Coccinella transversalis* Muls.
- 152 Nine spotted ladybug, *Coccinella 9-notata* Herbst.
- 153 Three banded ladybug, *Coccinella trifasciata* Linn.
- 154 Parenthetical ladybug, *Hippodamia parenthesis* Say
- 155 Convergent ladybug, *Hippodamia convergens* Guer.
- 156 Spotted ladybug, *Megilla maculata* DeG.
- 157 Spined soldier bug, *Podisus spinosus* Dall.
- 158 Lace-winged fly, *Chrysopa* species.

Silkworms

The mulberry silkworm is the insect which produces all the raw material from which silks are manufactured. Several related species are also represented in the collection.

159 Mulberry silkworm, *Bombyx mori* Linn.

160 Cynthia moth, *Samia cynthia* Dru.

161 Polyphemus moth: American silkworm, *Telega polyphemus* Cram.

162 Japanese silkworm, *Antheraea yamamai* Guer.

163 Chinese silkworm, *Antheraea pernyi* Guer.

SCALE INSECTS, Coccidae (164-202)

A natural group of great economic importance.

Chief articles on the group

Comstock, J. H. U. S. dep't agric. Rep't, '80. p. 276-349; Cornell univ. dep't ent. 2d rep't, '83. p. 45-147.

Cockerell, T. D. A. Check list of the Coccidae. Ill. state lab. nat. hist. Bul. '96, v. 4, art. 11, p. 318-39; supplement, Ill. state lab. nat. hist. Bul. '99, v. 5, art. 7, p. 389-98.

164 Cottony cushion scale insect, *Icerya purchasi* Mask. This species is of interest on account of its threatening the destruction of the citrus fruit industry of California about 1880. Principal food plants: citrus trees.

Treatment: Importation of natural enemies, fumigation with hydrocyanic acid gas.

Chief articles: Riley, C. V. U. S. dep't agric. Rep't, '86. p. 466-91.

165 Elm tree bark louse, *Gossyparia ulmi* Geoff. Principal food plant: European elms.

Treatment: Spray with kerosene emulsion or a whale oil soap solution in early spring.

Chief accessible articles: Lintner, J. A., state ent. 12th rep't, '96. p. 292-97; Felt, E. P. N. Y. state mus. Bul. 20. '98. p. 16-18; — — — Bul. 27. '99. p. 46; — — — Fisheries, game and forest com. 5th rep't, '99. p. 375-79.

166 Oak kermes, *Kermes galliformis* Riley. Principal food plant: oaks; rarely injurious.

167 **Golden oak scale insect**, *Asterolecanium variolosum* Ratz. Principal food plant: oak.

Treatment: Spray with kerosene emulsion in early summer.

Chief accessible articles: Lowe, V. H. N. Y. agric. exp. sta. Rep't, '95. p. 550-51.

168 **Barnacle scale insect**, *Ceroplastes cirripediformis* Comst. A southern species which occurs on orange and quince.

169 **Lecanium armeniacum** Craw. A species recently introduced into New York state.

Principal food plants: grape, currant.

Chief accessible notice: Felt, E. P., state ent. 14th rep't, '98. p. 240.

170 **Cherry lecanium**, *Lecanium cerasifex* Fitch. Occurs rather commonly on maple, oak, cherry and apple trees.

Treatment: Spray infested trees in winter or in early spring with kerosene emulsion (1-4).

171 **Lecanium fitchii** Sign. Infests raspberry and blackberry bushes.

172 **Common greenhouse lecanium**, *Lecanium hesperidum* Linn. A bad pest on many house and greenhouse plants.

Treatment: Spray or wash plants with kerosene emulsion or a soap solution.

173 **Black scale insect**, *Lecanium oleae* Bern. A serious pest on many plants in California.

174 **New York plum scale insect**, *Lecanium prunastri* Fonsc. Principal food plant: plum.

Treatment: Spray infested trees with kerosene emulsion (1-4) just after the leaves fall.

Chief accessible articles: Slingerland, M. V. Cornell agric. exp. sta. Bul. 83. '94. p. 681-99; — — — Bul. 108. '96. p. 82-86; Lowe, V. H. N. Y. agric. exp. sta. Bul. 136. '97. p. 583-86.

175 **Tuliptree scale insect**, *Lecanium tulipiferae* Cook. Principal food plant: tuliptree.

Treatment: Spray infested trees with kerosene emulsion or whale oil soap solution.

Chief accessible article: **Felt, E. P.**, state ent. 14th rep't, '98. (Mus. bul. 23) p. 213-16.

176 **Cottony maple tree scale insect**, *Pulvinaria innumerabilis* Rathv. Principal food plants: maple, elm, grape.

Treatment: Spray young in July with kerosene emulsion or whale oil soap solution. A powerful stream of cold water or a stiff brush will dislodge many females.

Chief accessible articles: **Lintner, J. A.**, state ent. 6th rep't, '90. p. 141-47; **Felt, E. P.** Fisheries, game and forest com. 4th rep't, sep. '98. p. 29-31; **Howard, L. O.** U. S. dep't agric. div. ent. Bul. 22, n. s. '00. p. 8-16.

177 **Putnam's scale insect**, *Aspidiotus ancyclus* Putn. Principal food plants: maple, elm, currant, fruit trees.

Treatment: rarely injurious.

Chief accessible articles: **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 136. '97. p. 593; **Felt, E. P.** N. Y. state mus. Bul. 46. '01. p. 326-30.

178 ***Aspidiotus dictyospermi* Morg.** A greenhouse species occurring on *Areca lutescens*.

179 **Cherry scale insect**, *Aspidiotus forbesi* Johns. Principal food plants: cherry and apple trees.

Treatment: Spray infested trees in winter or early spring with a contact insecticide.

Chief accessible article: **Felt, E. P.** N. Y. state mus. Bul. 46. '01. p. 330-32.

180 **Ivy scale insect**, *Aspidiotus hederæ* Vall. Principal food plants: common on ivy and a number of other greenhouse plants.

Treatment: Spray infested plants with an ivory or whale oil soap solution.

Chief accessible articles: **Lintner, J. A.**, state ent. 11th rep't, '96. p. 203-4; **Felt, E. P.** N. Y. state mus. Bul. 46. '01. p. 333-36.

181 ***Aspidiotus lataniae* Sign.** A greenhouse species infesting palms.

182 **European fruit tree scale insect**, *Aspidiotus ostreaeformis* Curt. Principal food plant: plum.

Treatment: Spray infested trees in winter or early spring with contact insecticides.

Chief accessible article: Felt, E. P. N. Y. state mus. Bul. 46. '01. p. 323-26.

183 **San José scale insect**, *Aspidiotus perniciosus* Comst. Principal food plants: fruit and many other trees and shrubs.

Treatment: Spray infested trees in winter or early spring with whale oil soap or a mechanical emulsion of crude petroleum.

Chief accessible articles: Lintner, J. A., state ent. 11th rep't, '96. p. 200-33; Howard, L. O., and Marlatt, C. L. U. S. dep't agric. div. ent. Bul. 4, n. s. '96. p. 1-80; Lowe, V. H. N. Y. agric. exp. sta. Bul. 136. '97. p. 571-602; Howard, L. O., U. S. dep't agric. div. ent. Bul. 12, n. s. '98. p. 1, 1-32; Felt, E. P., state ent. 16th rep't, '00. p. 967-88; — N. Y. state mus. Bul. 46. '01. p. 304-23, 336-42.

184 **Gloomy scale insect**, *Aspidiotus tenebricosus* Comst. A southern species infesting red maple.

185 **Elm Aspidiotus**, *Aspidiotus ulmi* Johns. Principal food plant: elm, rarely injurious.

186 **Grapevine Aspidiotus**, *Aspidiotus uvae* Comst. A southern species infesting grapevines.

187 **Red scale insect of Florida**, *Chrysomphalus aonidium* Linn. Principal food plants: on palms and other greenhouse plants.

Treatment: Wash or spray infested plants with whale oil or other soap solution.

188 **Xerophilaspis prosopidis** Ckll. A southern species occurring on *Prosopis velutina*.

189 **Cactus scale insect**, *Diaspis calyptroides* Costa. Found on cactuses in greenhouses.

190 **Juniper scale insect**, *Diaspis carueli* Targ. Found occasionally on juniper in New York state.

191 **Peach scale insect**, *Diaspis pentagona* Targ. A dangerous subtropic species which has become established in localities in the southern United States.

192 **Aulacaspis boisduvalii** Sign. Found on a greenhouse orchid.

193 *Aulacaspis elegans* Leon. A greenhouse species infesting *Cycas revoluta*, frequently called sago palm.

194 Rose scale insect, *Aulacaspis rosae* Sandb. Principal food plants: rose, blackberry, raspberry bushes.

Treatment: Spray infested plants with kerosene emulsion or whale oil soap solution.

195 Orange chaff scale insect, *Parlatoria pergandii* Comst. Chief food plants: orange, tangerine.

It is limited to greenhouses in the north.

196 Orange scale insect, *Mytilaspis citricola* Pack. Occurs on oranges in the south and may infest trees kept in greenhouses in the north.

197 Appletree bark louse, *Mytilaspis pomorum* Bouché. Principal food plants: apple and many other trees.

Treatment: Spray young about June 1 with kerosene emulsion or whale oil soap solution.

Chief accessible articles: Lintner, J. A., state ent. 4th rep't, '88. p. 114-20; Howard, L. O. U. S. dep't agric. Yearbook. '94. p. 254-59; Felt, E. P. N. Y. state mus. Bul. 46. '01. p. 297-300.

198 Elm Chionaspis, *Chionaspis americana* Johns. Rather common on American elm, rarely very injurious.

199 Euonymus scale insect, *Chionaspis euonymi* Comst. Principal food plant: Euonymus or strawberry tree.

200 Scurfy bark louse, *Chionaspis furfura* Fitch. Principal food plant: apple and other fruit trees.

Treatment: Spray young about June 1 with kerosene emulsion or whale oil soap solution.

Chief accessible articles: Howard, L. O. U. S. dep't agric. Yearbook. '94. p. 259-61; Felt, E. P. N. Y. state mus. Bul. 46. '01. p. 300-4.

201 Pine leaf scale insect, *Chionaspis pinifoliae* Fitch. Attacks various pines, specially those growing in parks.

Chief accessible notice: Lintner, J. A., state ent. 11th rep't, '96. p. 203.

202 *Hemichionaspis aspidistrae* Sign. Infests ferns in greenhouses.

FOREST INSECTS (203-51)

General works on the group

Fitch, Asa. Noxious and beneficial insects of New York. 4th rep't, '57. p. 5-67; ——— 5th rep't, '58. p. 1-74.

Packard, A. S. Forest insects. U. S. ent. com. 5th rep't, '90. p. 1-957.

Hopkins, A. D. Catalogue of West Virginia forest and shade tree insects. W. Va. agric. exp. sta. Bul. 32. '93. p. 171-251; ——— Preliminary report on the insect enemies of forests in the northwest. U. S. dep't agric. div. ent. Bul. 21, n. s. '99. p. 1-27.

Woodborers, various species.

203 *Xiphydria provancheri* Cr. A borer in paper birch, Adirondack region.

204 Carpenter moth, *Prionoxystus robiniae* Peck. A serious enemy of maple and oak trees.

205 Pitch pine twig Tortrix, *Retinia comstockiana* Fern. A twig-borer causing considerable exudations of pitch.

206 Bronze birch borer, *Agilus anxius* Gory. Principal food plant: white birch, specially injurious in parks.

Treatment: Cut and burn badly infested trees.

Chief accessible article: Chittenden, F. H. U. S. dep't agric. div. ent. Bul. 18, n. s. '98. p. 44-51.

207 Mapletree pruner, *Elaphidion villosum* Fabr. Principal food plants: maple, oak.

Treatment: Gather and burn cut limbs in fall or early spring.

Chief accessible articles: Lintner, J. A., state ent. 9th rep't, '92. p. 357-61; Felt, E. P. Fisheries, game and forest com. 4th rep't. sep. '98. p. 28-29.

208 Pine sawyer, *Monohammus confusor* Kirby. Attacks pines and spruces.

209 Pine sawyer, *Monohammus scutellatus* Say. Attacks pines.

210 *Monohammus titillator* Fabr. Attacks pines.

211 Poplar borer, *Saperda calcarata* Say. A serious enemy of poplars in some localities.

212 Painted hickory borer, *Cyllene pictus* Drury. Attacks hickory.

Chief accessible article: Lintner, J. A., state ent. 8th rep't. '91. p. 175-76.

213 **Locust borer**, *Cyllene robiniae* Forst. A serious enemy of locusttrees.

Chief accessible article: **Hopkins, A. D.** W. Va. agric. exp. sta. Bul. 16. '91. p. 88.

214 **Ribbed Rhagium**, *Rhagium lineatum* Oliv. Works under dead or dying pine bark.

215 **White pine weevil**, *Pissodes strobi* Peck. Injures terminal shoots of pine.

216 **Willow snout beetle**, *Cryptorhynchus lapathi* Linn. An introduced borer which injures poplar and willow.

Bark and wood borers, Scolytids

General works on the group

Hopkins, A. D. Catalogue of West Virginia Scolytidae and their enemies. W. Va. agric. exp. sta. Bul. 31. '93. p. 121-68.

Hubbard, H. G. U. S. dep't agric. div. ent. Bul. 7, n. s. '97. p. 9-30.

217 **Monarthrum mali** Fitch. Attacks beech, apple.

Chief accessible article: **Fitch, Asa.** Noxious and beneficial insects of New York. 3d rep't, '56. p. 8-9.

218 **Gnathotrichus materiarius** Fitch. Attacks white and pitch pine.

219 **Pityogenes** sp. Attacks white pine.

220 **Pityophthorus minutissimus** Zimm. A bark-miner of red oak.

221 **Pityophthorus** sp. Working in dead limbs of black birch.

222 **Xyloterus politus** Say. Attacks beech and soft maple.

223 **X. bivittatus** Kirby. Attacks balsam stumps.

224 **Cryphalus striatus** Mann. Attacks balsam, spruce and hemlock.

225 **Dryocoetes eichhoffi** Hopk. Taken under bark of yellow birch stump.

226 **Dryocoetes** sp. Working in bark of spruce logs.

227 **Xylocleptes** sp. Boring in partly decayed twigs of sugar maple.

228 **Tomicus calligraphus** Germ. Abundant in thicker bark of dying white and pitch pines.

229 *T. cacographus* Lec. Works in the thinner bark of white and pitch pines.

230 *T. pini* Say. Sometimes abundant in bark of young white pines.

231 *T. balsameus* Lec. A serious enemy of balsam trees.

232 *T. caelatus* Eich. Works in thinner bark of white and pitch pines.

233 Spruce bark beetle, *Polygraphus rufipennis* Kirby. A serious enemy of the spruce and occurs occasionally in balsam trees.

234 *Phlaeosinus dentatus* Say. Attacks recently cut or dying arbor vitae.

235 Boring *Dendroctonus*, *Dendroctonus terebrans* Oliv. Attacks pitch pines.

Leaf feeders, etc.

236 Pine sawfly, *Lophyrus lecontei* Fitch. Strips the needles from white pines.

237 Poplar sawfly, *Trichiocampus viminalis* Fall. Attacks poplar.

Chief accessible article: Lintner, J. A., state ent. 4th rep't, '88. p. 44-46.

238 Cherry leaf beetle, *Galerucella cavicollis* Lec. Feeds on wild cherry in Adirondacks, occasionally it attacks cultivated trees.

Treatment: Spray the foliage with an arsenical poison.

Chief accessible article: Lintner, J. A., state ent. 11th rep't, '95. p. 197-98.

239 Locust leaf-miner, *Odontota dorsalis* Thunb. Attacks locust trees.

Chief accessible article: Lintner, J. A., state ent. 12th rep't, '96. p. 264-67.

240 Forest tent-caterpillar, *Clisiocampa distria* Hübn. Chief food plants: maple, elm, apple.

Treatment: Protect birds, collect eggs, spray domesticated trees with an arsenical poison.

Chief accessible articles: **Felt, E. P.**, state ent. 14th rep't, '98. p. 191-201; — Fisheries, game and forest com. 4th rep't, sep. '98. p. 10-16; **Lowe, V. H.** N. Y. agric. exp. sta. Bul. 159. '99. p. 33-60; **Slingerland, M. V.** Cornell agric. exp. sta. Bul. 170. '99. p. 557-64; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59:275-76; — state ent. 16th rep't, '01. p. 994-98.

241 *Pimpla conquisitor* Say. A parasite of 240.

242 *Tachina mella* Walk. A parasite of 240.

243 *Theronia fulvescens* Cress. A parasite of 240.

244 *Pteromalus vanessae* How. A parasite of 240.

245 Fall webworm, *Hyphantria cunea* Drury. Principal food plants: white elm, willows and poplars.

Treatment: Spray infested limbs with an arsenical poison.

Chief accessible articles: **Riley, C. V.** U. S. dep't agric. div. ent. Bul. 10. '87. p. 33-53; **Howard, L. O.** U. S. dep't agric. Year-book. '95. p. 375-76; **Felt, E. P.** Fisheries, game and forest com. 5th rep't, '99. p. 363-68.

246 Orange striped oak worm, *Anisota senatoria* Abb. & Sm. Principal food plants: various species of oak.

Chief accessible article: **Lintner, J. A.**, state ent. 5th rep't, '89. p. 192-200.

247 Hickory tussock moth, *Halisidota caryae* Harris. Principal food plants: hickory, walnut, butternut.

248 Cherrytree tortrix, *Cacoecia cerasivorana* Fitch. Principal food plant: cherry, birch.

249 Birch Bucculatrix, *Bucculatrix canadensisella* Chamb. Sometimes very injurious to white birch.

250 Maple leaf-miner, *Lithocolletis aceriella* Clem. Attacks leaves of maples and witch-hazel.

251 17 year cicada, *Cicada septendecim* Linn. Injures twigs of many trees by cutting slits in them for the reception of eggs.

Chief accessible articles: **Lintner, J. A.**, state ent. 12th rep't, '96. p. 272-89; **Marlatt, C. L.** U. S. dep't agric. div. ent. Bul. 14. '98. p. 148.

SHADE TREE INSECTS (252-67)

252 **Mapletree borer**, *Plagionotus speciosus* Say. Principal food plant: sugar mapletrees.

Treatment: Dig out the young borers.

Chief accessible articles: **Lintner, J. A.**, state ent. 12th rep't. '96. p. 237-48; **Felt, E. P.** Fisheries, game and forest com. 4th rep't, sep. '98. p. 22-28; — N. Y. state agric. soc. Trans. '99. 59:277-78.

253 **Leopard moth**, *Zeuzera pyrina* Fabr. Chief food plants: attacks a large number of trees.

Treatment: Destroy females, dig out young borers, kill larger ones in burrows with carbon bisulfid.

Chief accessible articles: **Lintner, J. A.** state ent. 9th rep't. '93. p. 426-27; **Felt, E. P.** Fisheries, game and forest com. 4th rep't, sep. '98. p. 16-20.

254 **Elm bark-borer**, *Saperda tridentata* Oliv. Principal food plant: American elm.

Treatment: Cut and burn badly infested trees or limbs.

Chief accessible articles: **Lintner, J. A.**, state ent. 12th rep't. '96. p. 243-48; **Felt, E. P.** N. Y. state agric. soc. Trans. '99. 59: 278-79; — Fisheries, game and forest com. 5th rep't. '99. p. 371-75.

255 **Elm snout beetle**, *Magdalis barbata* Say. Principal food plant: American elm.

Treatment: Cut and burn badly infested limbs.

Chief accessible notices: **Felt, E. P.** N. Y. state mus. Bul. 37. '00. p. 22; — Fisheries, game and forest com. 5th rep't, '99. p. 374.

256 **Pigeon tremex**, *Tremex columba* Linn. Principal food plants: diseased maples and elms.

Chief accessible notices: **Felt, E. P.** N. Y. state mus. Bul. 20. '98. p. 18-19; — Fisheries, game and forest com. 4th rep't. '98. p. 25-26.

257 **Lunate long sting**, *Thalessa lunator* Fabr. A parasite of 256.

Chief accessible articles: **Lintner, J. A.**, state ent. 4th rep't, '88. p. 35-41; **Felt, E. P.** Fisheries, game and forest com. 4th rep't, sep. '98. p. 25-26.

258 **Elm bark louse**, *Gossyparia ulmi* Geoff. Chief food plants: European elms.

Treatment: Brush or wash off the bark lice, spray in July or early spring with kerosene emulsion or whale oil soap.

Chief accessible articles: **Lintner, J. A.**, state ent. 12th rep't, '96. p. 292-98; **Felt, E. P.** N. Y. state mus. Bul. 20. '98. p. 10-18; — Fisheries, game and forest com. 5th rep't, '99. p. 375-79.

259 **Elm leaf beetle**, *Galerucella luteola* Müll. Principal food plants: European elms.

Treatment: Spray infested trees with arsenical poisons.

Chief accessible articles: **Lintner, J. A.**, state ent. 5th rep't, '89. p. 234-42; — — 11th rep't, '95. p. 189-96; **Howard, L. O.** U. S. dep't agric. Yearbook. '95. p. 363-68; **Lintner, J. A.** state ent. 12th rep't, '96. p. 253-64; **Felt, E. P.** N. Y. state mus. Bul. 20. '98. p. 1-43; — state ent. 14th rep't, '98. p. 232-35; — N. Y. state agric. soc. Trans. '99, 59: 279; — Fisheries, game and forest com. 5th rep't, '99. p. 354-59.

260 **Spined soldier bug**, *Podisus spinosus* Dall. An enemy of 259.

261 **Fungus disease**, *Sporotrichum entomophilum* Peck. An enemy of 259.

262 **White marked tussock moth**, *Notolophus leucostigma* Abb. & Sm. Principal food plants: horsechestnut, linden, maple and elm trees.

Treatment: Collect and destroy egg masses, spray infested trees with arsenical poisons.

Chief accessible articles: **Lintner, J. A.**, state ent. 2d rep't, '85. p. 68-89; — 11th rep't, '95. p. 124-26; **Howard, L. O.** U. S. dep't. agric. Yearbook. '95. p. 368-75; **Felt, E. P.**, state ent. 14th rep't, '98. p. 163-76; — Fisheries, game and forest com. 4th rep't, sep. '98. p. 4-10.

263 **Pimpla conquisitor** Say. A parasite of 262.

264 **Tachina mella** Walk. A parasite of 262.

265 **Bag worm**, *Thyridopteryx ephemeraeformis* Haw. Principal food plants: arbor vitae, red cedar.

Treatment: Hand picking, spray with arsenical poisons.

Chief accessible articles: **Lintner, J. A.**, state ent. 1st rep't, '82. p. 81-87; **Riley, C. V.** U. S. dep't agric. div. ent. Bul. 10. '87. p. 22-28; **Felt, E. P.** Fisheries, game and forest com. 5th rep't, '99. p. 359-63.

266 **Spiny elm caterpillar**, *Euvanessa antiopa* Linn. Principal food plants: elm, willow, poplar.

Treatment: Spray infested trees with arsenical poisons.

Chief accessible articles: **Weed, C. M.** N. H. agric. exp. sta. Bul. '67. '99. p. 125-41; **Felt, E. P.** Fisheries, game and forest com. 5th rep't, '99. p. 368-71.

267 **Pteromalus fuscipes** Prov. A parasite of 266.

WORK OF GALL INSECTS (268-97)

Galls of sawflies, Tenthredinidae

268 **Willow apple gall**, *Pontania pomum* Walsh

4 winged gallflies, Cynipidae

269 **Mealy rose gall**, *Rhodites ignota* O. S.

270 **Mossy rose gall**, *Rhodites rosae* Linn.

271 **Large oak apple**, *Amphibolips confluentus* Harr.

272 **Black scrub oak apple**, *Amphibolips ilicifoliae* Bass.

273 **Oak plum gall**, *Amphibolips prunus* Walsh

274 **Gall of wool sower**, *Andricus seminator* Harris

275 **Oak leaf-stalk gall**, *Andricus petiolicola* Bass.

276 **Oak-wool gall**, *Andricus lana* Fitch

277 **Woolly oak gall**, *Andricus operator* O. S.

278 **Fuzzy chestnut leaf gall**, ? *Cynips prinoides* Beutm.

279 **Lobed oak gall**, *Cynips strobilana* O. S.

280 *Cynips decidua* Bass.

281 **Oak fig gall**, *Biorhiza forticornis* Walsh

282 **Larger empty oak apple**, *Holcaspis inanis* O. S.

- 283 Bullet gall, *Holcaspis globulus* Fitch
 284 Rough bullet gall, *Holcaspis duricola* Bass.
 285 Oak leaf bullet gall, *Dryophanta polita* Bass.
 286 Oak potato gall, *Neuroterus batatus* Fitch

2 winged gallflies, Diptera

Gall gnats, Cecidomyiidae

- 287 Hickory leaf gall, *Cecidomyia holotricha*
 O. S.
 288 Willow cone gall, *Cecidomyia strobiloides*
 O. S.
 289 Balsam leaf gall, *Cecidomyia balsamicola*
 Lintn.

Trypetid galls

- 290 Small solidago gall, *Trypeta polita* Loew
 291 Large solidago gall, *Trypeta solidaginis* Fitch

Psyllid galls, Psyllidae

- 292 Hackberry leaf gall, *Pachyphylla celtidis-*
mamma Riley

Galls of plant lice, Aphididae.

- 293 Witch-hazel gall, *Hormaphis hamamelidis*
 Fitch
 294 Cocksecomb elm gall, *Colophaulmicola* Fitch
 295 Poplar leaf stem gall, *Pemphigus populi-*
transversus Riley
 296 Phylloxera galls, *Phylloxera vitifoliae* Fitch
 297 Larch aphid gall, *Chermes abietis* Linn.

BEE AND WASP FAMILY, Hymenoptera (298-384)

Long-tongued bees Apidae

- 298 Honey bee, *Apis mellifica* Linn.
 299 *Bombus virginicus* Oliv.
 300 *B. vagans* Smith
 301 *B. terricola* Kirby
 302 *B. ternarius* Say
 303 *B. fervidus* Fabr.
 304 *Psithyrus elatus* Fabr.
 305 *P. ashtoni* Cr.

- 306 *Xylocopa virginica* Drury
- 307 *Clisodon terminalis* Cr.
- 308 *Melissodes perplexa* Cr.
- 309 *M. aurigenia* Cr.
- 310 *Ceratina dupla* Say
- 311 *Megachile montivaga* Cr.
- 312 *M. melanophaea* Smith
- 313 *M. latimanus* Say
- 314 *Alcidamea producta* Cr.
- 315 *Andronicus cylindricus* Cr.
- 316 *Osmia lignaria* Say
- 317 *Stelis lateralis* Cr.

Short-tongued bees Andrenidae

- 318 *Andrena vicina* Smith
- 319 *A. nubecula* Smith
- 320 *A. forbesii* Rob.
- 321 *A. crataegi* Rob.
- 322 *Augochlora pura* Say
- 323 *Halictus zephyrus* Smith
- 324 *H. pilosus* Smith
- 325 *H. confusus* Smith
- 326 *Sphécodes arvensis* Ptn.
- 327 *Prosopis elliptica* Kirby
- 328 *P. affinis* Smith
- 329 *Colletes inaequalis* Say

Social wasps, Vespidae

- 330 *Vespa vulgaris* Linn.
- 331 **White-faced hornet**, *Vespa maculata* Linn.
- 332 *Vespa germanica* Fabr.
- 333 **Yellow jacket**, *Vespa diabolica* Sauss.
- 334 *Vespa consobrina* Sauss.
- 335 *V. arenaria* Fabr.
- 336 **Common wasp**, *Polistes pallipes* St Farg.

Solitary wasps, Eumenidae

- 337 *Odynerus unifasciatus* Sauss.
- 338 *O. philadelphiae* Sauss.

Crabronidae

- 339 *Crabro trifasciatus* Say
 340 *C. 6-maculatus* Say
 341 *C. producticollis* Pack.
 342 *C. interruptus* St Farg.

Pemphredonidae

- 343 *Pemphredon concolor* Say

Philanthidae

- 344 *Cerceris dentifrons* Cr.
 345 *Philanthus bilunatus* Cr.

Nyssonidae

- 346 *Hoplisus phaleratus* Say

Bembecidae

- 347 *Monedula ventralis* Say
 348 *M. 4fasciata* Say
 349 *Microbembex monodonta* Say
 350 *Bembex fasciata* Fabr.

Thread-waisted wasps, Sphecidae

- 351 *SpheX ichneumonea* Linn.
 352 *Isodontia philadelphica* St Farg.
 353 **Mud dauber**, *Chalybion caeruleum* Linn.
 354 **Mud dauber**, *Pelopoeus cementarius* Drury
 355 *Ammophila gracilis* St Farg.
 356 *A. communis* Cr.

Spider wasps, Pompilidae

- 357 *Pompilus marginatus* Say
 358 *P. aethiops* Cr.

Scoliidae

- 359 *Myzine 6-cincta* Fabr.
 360 *Tiphia inornata* Say

Ants, Formicidae

- 361 *Camponotus herculeanus* Linn.

Cuckoo flies, Chrysididae

- 362 ? *Chrysis* sp.

Pelecinidae

363 *Pelecinus polyturator* Drury

Chalcis flies, Chalcididae

364 *Dibrachys boucheanus* Ratz.

365 *Pteromalus vanessae* How.

366 *P. cuproideus* How.

367 *Isosoma captivum* How.

Braconidae

368 *Apanteles congregatus* Say

Ichneumon flies, Ichneumonidae

369 *Pimpla inquisitor* Say

370 **Lunate long sting**, *Thalessa lunator* Fabr.

371 **Black long sting**, *Thalessa atrata* Fabr.

372 *Opheltes glaucopterus* Linn.

373 *Exochilum mundum* Say

374 *Ophion purgatum* Say

375 *Cryptus nuncius* Say

376 *Ichneumon laetus* Brullé

Ensign flies, Evaniidae

377 *Foenus tarsatorius* Say

Gallflies, Cynipidae

378 *Holcaspis duricola* Bass

Horntails, Uroceridae

379 **Pigeon tremex**, *Tremex columba* Linn.

380 *Xiphydria provancheri* Cr.

381 **Currant stem girdler**, *Janus integer* Nort.

Sawflies, Tenthredinidae

382 *Tenthredo rufipes* Fabr.

383 *Allantus basilaris* Say

384 **American sawfly**, *Cimbex americana* Leach

BEETLES, Coleoptera (385-597)

Anthribidae

385 *Cratoparis lunatus* Fabr.

Bark-borers, Scolytidae

386 *Phloeotribus frontalis* Oliv.387 Spruce bark beetle, *Polygraphus rufipennis*
Kirby388 Fruit tree bark beetle, *Scolytus rugulosus* Ratz.389 *Tomicus balsameus* Lec.390 *T. pini* Say391 *T. calligraphus* Germ.392 *Xyloterus politus* Say393 *Pityogenes* sp.394 *Pityophthorus minutissimus* Zimm.395 *Pityophthorus* sp.

Bill bugs, Calandridae

396 Grain weevil, *Calandra granaria* Linn.

Brenthidae

397 *Eupsalis minuta* Drury

Snout beetles, Curculionidae

398 *Mononychus vulpeculus* Fabr.399 Willow snout beetle, *Cryptorhynchus lapathi*
Linn.400 Plum curculio, *Conotrachelus nenuphar*
Herbst401 Elm snout beetle, *Magdalis armicollis* Say402 Rhubarb curculio, *Lixus concavus* Say403 Punctured clover leaf weevil, *Phytonomus punctatus* Fabr.404 New York weevil, *Ithycerus noveboracensis*
Forst.

Scarred snout beetles, Otiorhynchidae

405 *Aphrastus taeniatus* Gyll.

Rhynchitidae

406 *Rhynchites bicolor* Fabr.

Blister beetles, Meloidae

- 407 Say's blister beetle, *Pomphopoea sayi* Lec.
 408 Black blister beetle, *Epicauta pennsylvanica*
 DeG.
 409 Striped blister beetle, *Epicauta vittata* Fabr.
 410 *Meloe angusticollis* Say

Anthicidae

- 411 *Notoxus anchora* Hentz.

Pythidae

- 412 *Pytho americanus* Kirby

Melandryidae

- 413 *Penthe obliquata* Fabr.

Darkling beetles, Tenebrionidae

- 414 Forked fungus beetle, *Boletotherus bifurcus*
 Fabr.
 415 *Hoplocephala bicornis* Oliv.
 416 Meal worm, *Tenebrio molitor* Linn.
 417 *Scotobates calcaratus* Fabr.
 418 *Upis ceramboides* Linn.
 419 *Iphthimus opacus* Lec.
 420 *Alobates pennsylvanica* DeG.

Weevils, Bruchidae

- 421 Bean weevil, *Bruchus obtectus* Say

Leaf beetles, Chrysomelidae

- 422 Argus beetle, *Chelymorpha argus* Licht.
 423 Clubbed tortoise beetle, *Coptocycla clavata*
 Fabr.
 424 Spotted tortoise beetle, *Coptocycla signifera*
 Herbst
 425 Golden tortoise beetle, *Coptocycla bicolor* Fabr.
 426 *Disonycha caroliniana* Fabr.
 427 Elm leaf beetle, *Galerucella luteola* Müll
 428 *Trirhabda canadensis* Kirby
 429 Striped cucumber beetle, *Diabrotica vittata*
 Fabr.

- 430 Willow leaf beetle, *Lina scripta* Fabr.
 431 *Gastroidea polygoni* Linn.
 432 *Chrysomela bigsbyana* Kirby
 433 *C. philadelphia* Linn.
 434 *C. scalaris* Lec.
 435 *C. elegans* Oliv.
 436 *C. similis* Rog.
 437 Potato beetle, *Doryphora 10-lineata* Say
 438 Three spotted *Doryphora*, *Doryphora clivicollis*
 Kirby
 439 Gold gilt beetle, *Chrysochus auratus* Fabr.
 440 *Chlamys plicata* Fabr.
 441 Twelve spotted asparagus beetle, *Crioceris 12-*
 punctata Linn.
 442 Asparagus beetle, *Crioceris asparagi* Linn.
 443 Three lined Lema, *Lema trilineata* Oliv.
 444 *Donacia femoralis* Kirby
 Long-horned woodborers, *Cerambycidae*
 445 Spotted milkweed beetle, *Tetraopes tetraop-*
 thalmus Forst.
 446 *Saperda puncticollis* Say
 447 *S. lateralis* Fabr.
 448 *S. vestita* Say
 449 *Liopus variegatus* Hald.
 450 *Monohammus maculosus* Hald.
 451 *Leptura vittata* Germ.
 452 *L. proxima* Say
 453 *L. vagans* Oliv.
 454 *L. rubrica* Say
 455 *L. canadensis* Fabr.
 456 *L. cordifera* Oliv.
 457 *Typocerus velutinus* Oliv.
 458 Cloaked knotty horn, *Desmocerus palliatus*
 Forst.
 459 *Euderees picipes* Fabr.
 460 *Clytanthus ruricola* Oliv.

- 461 *Neoclytus erythrocephalus* Fabr.
 462 *Xylotrechus undulatus* Say
 463 *X. colonus* Fabr.
 464 *Arhopalus fulminans* Fabr.
 465 *Phymatodes variabilis* Fabr.
 466 *Physocnemum brevilineum* Say
 467 *Criocephalus agrestis* Kirby
 468 Broad-necked Prionus, *Prionus laticollis* Drury
 469 Straight-bodied Prionid, *Orthosoma brunneum*
 Forst.

Spondylidae

- 470 *Parandra brunnea* Fabr.

Lamellicorn beetles, Scarabaeidae

- 471 *Trichius affinis* Gory
 472 Rough flower beetle, *Osmoderma scabra* Beauv.
 473 Hermit flower beetle, *Osmoderma eremicola*
 Knoch.
 474 Green June beetle, *Allorhina nitida* Linn.
 475 Spotted grapevine beetle, *Pelidnota punctata*
 Linn.
 476 Light-loving grapevine beetle, *Anomala lucicola*
 Fabr.
 477 June beetle, *Lachnosterna tristis* Fabr.
 478 Earth-boring dung beetle, *Geotrupes egeriei*
 Germ.
 479 Dung beetle, *Aphodius fimetarius* Linn.
 480 Tumble bug, *Copris anaglypticus* Say
 481 Tumble bug, *Canthon laevis* Drury

Stag beetles, Lucanidae

- 482 Horned passalus, *Passalus cornutus* Fabr.
 483 Antelope beetle, *Dorcus parallelus* Say
 484 Stag beetle, *Lucanus dama* Thunb.

Checkered beetles, Cleridae

- 485 *Clerus analis* Lec.
 486 *Trichodes nuttalli* Kirby

Fireflies, Lampyridae

- 487 Soldier beetle, *Chauliognathus pennsylvanicus* DeG.
 488 *Photuris pennsylvanica* DeG.
 489 *Ellychnia corrusca* Linn.
 490 *Eros aurora* Herbst
 491 *Calopteron reticulatum* Fabr.

Flat-headed woodborers, Buprestidae

- 492 Bronze birch borer, *Agrilus anxius* Gory
 493 Gouty gall beetle, *Agrilus ruficollis* Fabr.
 494 *Chrysobothris dentipes* Germ.
 495 Banded buprestid, *Buprestis fasciata* Fabr.
 496 *Dicerca divaricata* Say
 497 *Chalcophora liberta* Germ.
 498 *C. virginiensis* Drury

Snapping beetles, Elateridae

- 499 *Asaphes baridius* Say
 500 *Corymbites hieroglyphicus* Say
 501 *C. vernalis* Hentz.
 502 *Ludius abruptus* Say
 503 *Elater nigricollis* Herbst
 504 *Alaus myops* Fabr.
 505 Owl beetle, *Alaus oculatus* Linn.
 506 *Adelocera brevicornis* Lec.

Nitidulidae

- 507 Banded Ips, *Ips quadriguttatus* Fabr.
 508 *Omosita colon* Linn.
 509 *Nitidula bipustulata* Linn.

Histeridae

- 510 *Hister lecontei* Mars.
 511 *H. americanus* Payk.
 512 *H. furtivus* Say
 513 *H. abbreviatus* Fabr.

Dermestids, Dermestidae

- 514 *Anthrenus verbasci* Linn.
 515 Buffalo carpet beetle, *Anthrenus serophu-
 lariae* Linn.
 516 Black carpet beetle, *Attagenus piceus* Oliv.
 517 Larder beetle, *Dermestes lardarius* Linn.
 518 *Dermestes caninus* Germ.
 519 Pale brown *Byturus*, *Byturus unicolor* Say

Cucujids, Cucujidae

- 520 *Brontes dubius* Fabr.
 521 *Cathartus gemellatus* Duv.
 522 Corn *Silvanus*, *Silvanus surinamensis* Linn.

Erotylidae

- 523 *Megalodaene heros* Say

Lady bugs, Coccinellidae

- 524 Northern lady bug, *Epilachna borealis* Fabr.
 525 *Brachyaeantha ursina* Fabr.
 526 Twice stabbed lady bug, *Chilocorus bivulnerus*
 Muls.
 527 15 spotted lady bug, *Anatis ocellata* Linn.
 528 Two spotted lady bug, *Adalia bipunctata* Linn.
 529 *Coccinella sanguinea* Linn.
 530 Nine spotted lady bug, *Coccinella 9-notata*
 Herbst
 531 Three banded lady bug, *Coccinella trifasciata*
 Linn.
 532 Parenthetical lady bug, *Hippodamia paren-
 thesis* Say
 533 13 spotted lady bug, *Hippodamia 13-punctata*
 Linn.
 534 Convergent lady bug, *Hippodamia conver-
 gens* Guer.
 535 Spotted lady bug, *Megilla maculata* DeG.

Rove beetles, Staphylinidae

- 536 *Paederus littorarius* Grav.
 537 *Staphylinus cinnamopterus* Grav.

- 538 *S. maculosus* Grav.
 539 *Creophilus villosus* Grav.
 540 *Listotrophus cingulatus* Grav.

Carrion beetles, Silphidae

Carrion beetles, Silpha

- 541 *Silpha americana* Linn.
 542 *S. noveboracensis* Forst.
 543 *S. inaequalis* Fabr.
 544 *S. lapponica* Herbst
 545 *S. surinamensis* Fabr.

Burying beetles, Necrophorus

- 546 *Necrophorus tomentosus* Web.
 547 *N. marginatus* Fabr.
 548 *N. americanus* Oliv.

Scavenger water beetles, Hydrophilidae

- 549 *Sphaeridium scarabaeoides* Linn.
 550 *Hydrobius fuscipes* Linn.
 551 *H. globosus* Say
 552 *Philhydrus cinctus* Say
 553 *Laccobius agilis* Rand.
 554 *Hydrocharis obtusatus* Say
 555 *Hydrophilus glaber* Herbst
 556 *H. mixtus* Lec.
 557 *H. nimbatus* Say
 558 *H. triangularis* Say
 559 *Helophorus lineatus* Say

Whirligig beetles, Gyrinidae

- 560 *Dineutes discolor* Aubé.
 561 *Gyrinus picipes* Aubé.
 562 *G. consobrinus* Lec.
 563 *G. ventralis* Kirby
 564 *G. minutus* Fabr.

Predaceous diving beetles, Dytiscidae

- 565 *Acilius semisulcatus* Aubé.
 566 *Colymbetes sculptilis* Harris

- 567 *Rhantus binotatus* Harris
568 *Agabus gagates* Aubé.
569 *A. punctulatus* Aubé.
570 *Ilybius biguttalus* Germ.
571 *Deronectes griseostriatus* DeG.
572 *Laccophilus maculosus* Germ.

Haliplidae

- 573 *Haliphus ruficollis* DeG.
574 *H. fasciatus* Aubé.

Ground beetles, Carabidae

- 575 *Anisodactylus baltimorensis* Say
576 Pennsylvanian ground beetle, *Harpalus pennsylvanicus* DeG.
577 Dark ground beetle, *Harpalus caliginosus* Fabr.
578 *Chlaenius tricolor* Dej.
579 *C. sericeus* Forst.
580 *Galerita janus* Fabr.
581 *Casnonia pennsylvanica* Linn.
582 *Platynus cupripennis* Say
583 *Calathus gregarius* Say
584 *Dicaelus elongatus* Bon.
585 *Pterostichus lucublandus* Say
586 *P. stygius* Say
587 *Scarites subterraneus* Fabr.
588 *Elaphrus ruscarius* Say
589 Fiery hunter, *Calosoma calidum* Fabr.
590 Searcher, *Calosoma scrutator* Fabr.
591 *Carabus vinctus* Web.

Tiger beetles, Cicindelidae

- 592 Repand tiger beetle, *Cicindela repanda* Dej.
593 Common tiger beetle, *Cicindela vulgaris* Say
594 Noble tiger beetle, *Cicindela generosa* Dej.
595 Purple tiger beetle, *Cicindela purpurea* Oliv.
596 Six spotted tiger beetle, *Cicindela 6-guttata* Fabr.
597 *Cicindela longilabris* Say

FLEAS, Siphonaptera

- 598 Dog and cat flea, *Ceratopsyllus serraticeps* Gerv.

TWO-WINGED FLIES, Diptera (599-653)

Humpbacked flies, Phoridae

- 599 Mushroom Phora, *Phora agarici* Lintn.

Phytomyzidae

- 600 Chrysanthemum fly, *Phytomyza chrysanthemi* Kow.

Grain flies, Oscinidae

- 601 Prolific Chlorops, *Chloropisca variceps* Loew

Trypetidae

- 602 *Trypeta festiva* Loew
 603 *T. sparsa* Wied.
 604 *T. florescentiae* Linn.
 605 *T. longipennis* Wied.

Ortalidae

- 606 *Seoptera colon* Harris
 607 *Rivellia viridulans* R. Desv.

Dung flies, Cordyluridae

- 608 *Scatophaga stercoraria* Linn.

Anthomyiids, Anthomyiidae

- 609 Locust egg anthomyian, *Phorbia fusciceps* Zett.

House fly family, Muscidae

- 610 House fly, *Musca domestica* Linn.
 611 Cluster fly, *Pollenia rudis* Fabr.
 612 Horn fly, *Haematobia serrata* R. Desv.
 613 Stable fly, *Stomoxys calcitrans* Linn.

Flesh flies, Sarcophagidae

- 614 *Sarcophaga* sp.

Tachina flies, Tachinidae

- 615 *Tachina mella* Walk.
 616 *Bombyliomyia abrupta* Wied.

Syrphus flies, Syrphidae

- 617 *Spilomyia fusca* Loew
 618 *Helophilus similis* Macq.
 619 *Eristalis transversus* Wied.
 620 *E. tenax* Linn.
 621 *E. androclus* O. S.
 622 *E. flavipes* Walk.
 623 *E. bastardi* Macq.
 624 *Sericomyia limbipennis* Macq.
 625 *Rhingia nasica* Say
 626 *Sphaerophoria cylindrica* Say
 627 *Syrphus americanus* Wied.
 628 *S. lapponicus* Zett.

Bee flies, Bombyliidae

- 629 *Bombylius fratellus* Wied.
 630 *Argyramoeba simson* Fabr.
 631 *A. analis* Say
 632 *Anthrax sinuosa* Wied.
 633 *A. tegminipennis* Say
 634 *A. fulviana* Say
 635 *A. alternata* Say
 636 *Exoprosopa dorcadion* O. S.

Robber flies, Asilidae

- 637 *Diogmites discolor* Loew

Snipe flies, Leptidae

- 638 *Leptis punctipennis* Say
 639 *Chrysopila thoracica* Fabr.

Horse flies, Tabanidae

- 640 *Tabanus reinwardtii* Wied.
 641 **Mourning horse fly**, *Tabanus atratus* Fabr.
 642 **Banded horse fly**, *Theriopectes cinctus* Fabr.
 643 *Chrysops niger* Macq.

Soldier flies, Stratiomyiidae

- 644 *Stratiomyia picipes* Loew
 645 *Metoponia fuscitarsis* Say

Crane flies, Tipulidae646 *Tipula fuliginosa* Say**March flies, Bibionidae**647 *Scatopse notata* Linn.648 *Bibio albipennis* Say**Black flies, Simuliidae**649 Southern Buffalo gnat, *Simulium invenustum*
Walk.**Fungus gnats, Mycetophilidae**650 Manure fly, *Sciara coprophila* Lintn.651 *Asyndulum montanum* Roed.**Gall gnats, Cecidomyiidae**652 Birch seed midge, *Cecidomyia betulae* Wintz.653 Hessian fly, *Cecidomyia destructor* Say**BUTTERFLIES AND MOTHS, Lepidoptera (654-828)****BUTTERFLIES, Rhopalocera (654-722)****Four-footed butterflies, Nymphalidae**654 Milkweed butterfly, *Anosia plexippus* Linn.655 *Agraulis vanillae* Linn.656 *Thyridia psidii* Linn.657 *Lycorea pasinuntia* Cram.658 Regal fritillary, *Speyria idalia* Drury659 Great spangled fritillary, *Argynnis cybele* Fabr.660 Silver spot fritillary, *Argynnis aphrodite* var.
alcestis Edw.661 Mountain silver spot, *Argynnis atlantis* Edw.662 Meadow fritillary, *Brenthis bellona* Fabr.663 *Pyrrhopyge acastus* Cram.664 *P. phidias* Linn.665 Pearl crescent, *Phyciodes tharos* var. *morpheus* Edw.666 Violet tip, *Polygonia interrogationis* var.
umbrosa Lintn.667 Hop merchant, *Polygonia comma* var. *harrisii* Edw.

- 668 Green comma, *Polygonia faunus* Edw.
 669 Gray comma, *Polygonia progne* Cram.
 670 Compton tortoise, *Eugonia j-album* Boisd. & Lec.
 671 Mourning cloak, *Euvanessa antiopa* Linn.
 672 American tortoise shell, *Aglaia milberti* Godt.
 673 Red admiral, *Vanessa atalanta* Linn.
 674 Painted beauty, *Vanessa huntera* Fabr.
 675 Buckeye, *Junonia coenia* Hübn.
 676 *Anartia amalthea* Linn.
 677 Red spotted purple, *Basilarchia astyanax* Fabr.
 678 Banded purple, *Basilarchia arthemis* Drury
 679 Bastard purple, *Basilarchia proserpina* Edw.
 680 Viceroy, *Basilarchia archippus* Cram.
 681 *Ageronia feronia* Hübn.
 682 *A. fornax* Hübn.
 683 Eyed brown, *Satyrodes eurydice* Linn. & Joh.
 684 Little wood satyr, *Cissia eurytus* Fabr.
 685 Dull-eyed grayling, *Cercyonis nephele* Kirby
 686 Blue-eyed grayling, *Cercyonis alope* Fabr.

Gossamer-winged butterflies, *Lycaenidae*

- 687 Hoary elfin, *Incisalia irus* Godt.
 688 Wanderer, *Feneseca tarquinius* Fabr.
 689 American copper, *Heodes hypophlaeas* Boisd.
 690 Pearl studded violet, *Rusticus scudderii* Edw.
 691 Spring azure, *Cyaniris pseudargiolus* Boisd. & Lec.
 692 Tailed blue, *Everes comyntas* Godt.

Pierids, *Pieridae*

- 693 ? *Eronia argia* Fabr. (Africa)
 694 Checkered white, *Pontia protodice* Boisd. & Lec.
 695 Gray-veined white, *Pieris oleracea* Harris
 696 Cabbage butterfly, *Pieris rapae* Linn.
 697 *Catopsilia menippe* Hübn.
 698 ? *C. statira* Cram.
 699 Cloudless sulfur, *Callidryas eubule* Linn.

- 700 *Zerene cesonia* Stoll.
 701 Clouded sulfur, *Eurymus philodice* Godt.
 702 *Eurymus philodice pallidice* Scudd.
 703 Little sulfur, *Eurema lisa* Boisd. & Lec.

Swallowtails, *Papilionidae*

- 704 *Iphiclides* sp.
 705 Zebra swallowtail, *Iphiclides ajax telamonoides* Feld.
 706 Tiger swallowtail, *Jasoniades glaucus turnus* Linn.
 707 Black swallowtail, *Papilio polyxenes* Fabr.
 708 ?*Papilio dolichaon* Cram.
 709 *P. sarpedon* Linn.
 710 Green clouded swallowtail, *Euphœades troilus* Linn.
 711 Blue swallowtail, *Laertias philenor* Linn.

Common skippers, *Hesperiidae*

- 712 Least skipper, *Ancyloxypha numitor* Fabr.
 713 Mormon, *Atrytone zabulon* Boisd. & Lec.
 714 Yellow spot, *Polites peckius* Kirby
 715 Long dash, *Thymelicus mystic* Edw.
 716 Tawny edged skipper, *Limochores taumas* Fabr.
 717 Dun skipper, *Euphyes metacomet* Harris
 718 Dusted skipper, *Lerema hianna* Scudd.
 719 Dreamy dusky wing, *Thanaos icelus* Lintn.
 720 Martial's dusky wing, *Thanaos martialis* Scudd.
 721 Sooty wing, *Pholisora catullus* Fabr.
 722 Silver spotted skipper, *Epargyreus tityrus* Fabr.

MOths, *Heterocera* (723-828)

Hawk moths, *Sphingidae*

- 723 Bumblebee hawk moth, *Hemaris diffinis* Boisd.
 724 *Amphionessus* Cram.
 725 *Deidamia inscripta* Harris
 726 White lined sphinx, *Deilephila lineata* Fabr.
 727 Grapevine hog caterpillar, *Ampelophaga myron* Cram.

728 Pen-marked sphinx, *Sphinx chersis* Hübn.

729 *Sphinx eremitis* Hübn.

730 *Ceratomia amyntor* Hübn.

Clear-winged moths, *Sesiidae*

731 Currant stem-borer, *Sesia tipuliformis* Linn.

Wood nymph moths, *Agaristidae*

732 Eight spotted forester, *Alypia octomaculata* Fabr.

Zygaenidae

733 *Lycomorpha pholus* Drury

734 *Ctenucha virginica* Charp.

Footman moths, *Lithosiidae*

735 *Hypoprepia fucosa* Hübn.

Tiger moths, *Arctiidae*

736 Bella moth, *Utetheisa bella* Linn.

737 *Haploa confusa* Lyman

738 Tiger moth, *Euprepia virgo* Linn.

739 Isabella tiger moth, *Pyrrharcia isabella* Abb. & Sm.

740 Salt marsh caterpillar, *Estigmene aceræa* Drury

741 Harlequin milkweed caterpillar, *Cyenia egle* Drury

742 *Halisidota tessellaris* Abb. & Sm.

743 Hickory tussock moth, *Halisidota caryæ* Harris

Tussock moths, *Lymantriidae*

744 *Notolophus antiqua* Linn.

745 Gipsy moth, *Porthetria dispar* Linn.

Flannel moths, *Megalopygidae*

746 Crinkled flannel moth, *Megalopyge crispata* Pack.

Bag worm moths, *Psychidae*

747 Bag worm moth, *Thyridopteryx ephemeraeformis* Haw.

Prominents, *Notodontidae*

748 *Cerura cinerea* Walk.

Giant silk worms, Saturniidae

- 749 Luna moth, *Tropaea luna* Linn.
750 Io moth, *Automeris io* Fabr.

Royal moths, Citheroniidae

- 751 Regal moth, *Citheronia regalis* Fabr.
752 Rosy anisota, *Anisota rubicunda* Fabr.

Lasiocampidae

- 753 Tent-caterpillar moth, *Clisiocampa americana* Fabr.

Carpenter moths, Cossidae

- 754 Carpenter moth, *Prionoxystus robiniae* Peck

Cymatophoridae

- 755 *Thyatira scripta* Gosse.

Owlet moths, Noctuidae

- 756 *Acronycta americana* Harris
757 *Feltia subgothica* Haw.
758 *Xylophasia arctica* Boisd.
759 *Trigonophora periculosa* Guen.
760 *Leucania pallens* Linn.
761 Pyramidal grapevine caterpillar, *Amphipyra pyramidoides* Guen.
762 *Orthosia helva* Grt.
763 *Cirroedia pampina* Guen.
764 *Scoliopteryx libatrix* Linn.
765 *Scopelosoma indirecta* Walk.
766 *Cucullia asteroides* Guen.
767 Cotton worm moth, *Aletia argillacea* Hübn.
768 *Plusia balluca* Geyer
769 *P. mortuorum* Guen.
770 Boll worm moth, *Heliothis armiger* Hübn.
771 *Alaria florida* Guen.
772 *Melaporphyria immortua* Grt.
773 *Erastria concinnimacula* Guen.
774 *Catocala cerogama* Guen.
775 *C. ultronia* Hübn.

- 776 *C. unijuga* Walk.
777 *C. cara* Guen.
778 *Parallelia bistriaris* Hübn.
779 *Panapoda rufimargo* var. *carneicosta*
Guen.
780 *Zale horrida* Hübn.
781 *Homoptera lunata* Drury
782 *H. minerea* Guen.

Measuring worms, Geometridae

- 783 *Sabulodes transversata* Drury
784 *Tetracis crocallata* Guen.
785 *Metanema inatomaria* Guen.
786 *Caberodes confusaria* Hübn.
787 *Ennomos subsignarius* Hübn.
788 *Azelina peplaria* Hübn.
789 *Euchlaena effectaria* Walk.
790 *Xanthotype crocataria* Fabr.
791 *Plagodis phlogosaria* Guen.
792 *Synchlora glaucaria* Guen.
793 *Deilinia erythremaria* Guen.
794 *Eudeilinia ?herminiata* Guen.
795 *Orthofidonia semiclarata* Walk.
796 *Sciagraphia mellistrigata* Grt.
797 *Caripeta angustiorata* Walk.
798 *Epelis faxonii* Minot
799 *Cingilia catenaria* Cram.
800 *Nepytia semiclusaria* Walk.
801 *Lycia cognataria* Guen.
802 *Euchoeca albovittata* Guen.
803 *Eucymatoge intestinata* Guen.
804 *Eustroma diversilineatum* Hübn.
805 *Mesolenca hersiliata* Guen.
806 *M. ruficiliata* Guen.
807 *M. lacustrata* Guen.
808 *Gypsochroa designata* Bork.

Pyraustidae

- 809 Grape leaf-folder, *Desmia funeralis* Hübn.
 810 *Pyrausta theseusalis* Walk.
 811 *Pantographa limata* Grt. & Rob.
 812 *Evergestis straminealis* Hübn.
 813 *Cataclysta ?opulentalis* Led.

Phycitidae

- 814 *Acrobasis rubrifasciella* Pack.

Close wings, Crambidae

- 815 *Argyria nivalis* Drury
 816 Wide-striped Crambus, *Crambus unistriatellus*
 Pack.
 817 *Crambus hastiferellus* Walk.
 818 Unmarked Crambus, *Crambus perlellus* Scop.
 819 Dark spotted Crambus, *Crambus mutabilis* Clem.

Plume moths, Pterophoridae

- 820 *Platyptilia ochrodaetyla* Hübn.
 821 Grapevine plume moth, *Oxyptilus periscelidactylus* Fitch

Leaf-rollers, Tortricidae

- 822 *Teras logiana* var. *viburnana* Clem.
 823 Oblique banded leaf-roller, *Cacoecia rosaceana*
 Harris
 824 Ugly nest tortricid, *Cacoecia cerasivorana*
 Fitch
 825 V-marked tortrix, *Cacoecia argyrospila* Walk.
 826 *Cenopis reticulatana* Clem.

Grapholithidae

- 827 Rose leaf tier, *Penthina nimbatana* Clem.

Tineina

- 828 Angoumois grain moth, *Sitotroga cerealella*
 Oliv.

CADDIS FLIES, Trichoptera (829-37)

- 829 *Platyphylax subfasciata* Say

SCORPION FLIES, Mecoptera

- 830 *Panorpa rufescens* Ramb.
831 *Bittacus strigosus* Hagen

DOBSON AND OTHERS, Neuroptera

- 832 Ant lion, *Myrmeleon immaculatus* DeGeer
833 *Polystoechotes punctatus* Fabr.
834 Lace-winged fly, *Chrysopa ? perla*
835 *Sialis infirma* Newm.
836 Dobson, *Corydalis cornuta* Linn.
837 Comb-horned fish fly, *Chauliodes serraticornis* Say

TRUE BUGS, Hemiptera (838-84)**Leaf hoppers, Jassidae**

- 838 Grapevine leaf hopper, *Typhlocyba comes* Say
839 Red lined leaf hopper, *Diedrocephala coccinea* Forst.

Tree hoppers, Membracidae

- 840 Woodbine Telamona, *Telamona ampelopsidis* Harris
841 Two spotted Enchenopa, *Enchenopa binotata* Say
842 *Stictocephala inermis* Fabr.
843 Buffalo tree hopper, *Ceresa bubalus* Fabr.

Spittle insects, Cercopidae

- 844 *Lepyronia 4-angularis* Say

Cicadas, Cicadidae

- 845 Dog day cicada, *Cicada tibicen* Linn.

Lantern fly family, Fulgoridae

- 846 *Ormenis pruinosa* Say

Plant lice, Aphididae

- 847 Cherry aphid, *Myzus cerasi* Fabr.
848 *Pemphigus acerifolii* Riley

Water boatmen, Corixidae

- 849 *Corixa interrupta* Say

Back swimmers, Notonectidae

850 *Notonecta undulata* Say

Water scorpions, Nepidae

851 *Nepa apiculata* Uhl.

Giant water bugs, Belostomidae

852 *Belostoma americanum* Leidy853 *Zaitha aurantiacum* Leidy

Water striders, Hydrobatidae

854 *Hygrotrechus conformis* Uhl.855 *Limmoporus rufoscutellatus* Lat.

Reduviidae

856 Kissing bug, *Opsicoetus personatus* Linn.857 *Acholla multispinosa* DeG.

Ambush bugs, Phymatidae

858 *Phymata wolffii* Stal.

Leaf bugs, Capsidae

859 Tarnished plant bug, *Elygus pratensis* Linn.860 *Calocoris rapidus* Say861 *Garganus fusiformis* Say862 *Capsus ater* Linn.863 Four lined leaf bug, *Poecilocapsus lineatus*
Fabr.864 *Leptopterna dolobrata* Linn.865 *Brachytropis calcarata* Fall.

Chinch bug family, Lygaeidae

866 *Lygaeus turcicus* Fabr.867 Chinch bug, *Blissus leucopterus* Say

Squash bug family, Coreidae

868 Box elder plant bug, *Leptocoris trivittatus*
Say869 Squash bug, *Anasa tristis* DeG.

Stink bug family, Pentatomidae

870 *Nezara hilaris* Say871 Harlequin cabbage bug, *Murgantia histrionica*
Hahn.

- 872 **Juniper plant bug**, *Pentatoma juniperina* Linn.
 873 *Euschistus fissilis* Uhl.
 874 *Mormidea lugens* Fabr.
 875 *Cosmopepla carnifex* Fabr.
 876 *Podisus serieventris* Uhl.
 877 *P. cynicus* Say

Burrowing bugs, Cydnidae

- 878 *Canthophorus cinctus* Beauv.

Shield-backed bugs, Scutelleridae

- 879 *Eurygaster alternatus* Say

Lice, Pediculidae

- 880 **Short-nosed cattle louse**, *Haematopinus eury-*
sternus Nitzsch
 881 **Hog louse**, *Haematopinus urius* Nitzsch

THRIPS, Physopoda

- 882 **Onion thrips**, *Thrips tabaci* Lind.

GRASSHOPPERS, LOCUSTS, Orthoptera (883-903)

Short-horned grasshoppers, Acrididae

- 883 **Green striped locust**, *Chortophaga viridifas-*
ciata DeG.
 884 **Clouded locust**, *Encoptolophus sordidus*
 Burm.
 885 **Carolina locust**, *Dissosteira carolina* Linn.
 886 **Red-legged locust**, *Melanoplus femur-rubrum*
 DeG.
 887 **Lesser migratory locust**, *Melanoplus atlantis*
 Riley
 888 *Melanoplus femoratus* Burm.
 889 **Coral-winged locust**, *Hippiscus tuberculatus*
 Beauv.
 890 **Pellucid locust**, *Camnula pellucida* Scudd.
 891 *Circotettix verruculatus* Scudd.

Long-horned grasshoppers, Locustidae

- 892 **Oblong leaf-winged katydid**, *Amblycorypha ob-*
longifolia DeG.

893 Broad-winged katydid, *Cyrtophyllus concavus*
Harris

894 Cone-headed katydid, *Conocephalus ensiger*
Harris

895 Spotted wingless grasshopper, *Ceuthophilus maculatus* Say

Crickets, Gryllidae

896 Common cricket, *Gryllus abbreviatus* Serv.

897 *Gryllus pennsylvanicus* Burm.

898 Long-winged mole cricket, *Gryllotalpa columbiana*
Scudd.

Walking sticks, Phasmidae

899 Walking stick, *Diaperomera femorata* Say

Praying mantis or mule-killer, Mantidae

900 Carolina mantis, *Stagmomantis carolina* Linn.

Cockroaches, Blattidae

901 Croton bug, *Phyllodromia germanica* Steph.

902 Cockroach, *Periplaneta orientalis* Fabr.

903 Wood cockroach, *Ischnoptera pennsylvanica*
DeG.

EARWIGS, Euplexoptera

904 Earwig, *Forficula auricularia* Linn.

PSOCIDS, Corrodentia

905 *Psocus venosus* Burm.

TERMITES, Isoptera

906 Termites, *Termes flavipes* Koll.

STONE FLIES, Plecoptera

907 *Leuctra tenella* Prov.

908 *Leuctra* sp.

909 *Perla*? *tristis* Hagen

910 *Perla* sp.

911 *Pteronarcys*? *regalis* Newm.

DRAGON FLIES, Odonata

912 *Leucorhinia intacta* Hagen

913 *Diplax rubicundula* Say

- 914 *Libellula pulchella* Drury
 915 *L. basalis* Say
 916 *Celithemis eponina* Drury
 917 *Micrathyria berenice* Drury
 918 *Plathemis 3-maculata* DeG.
 919 *Tetragoneuria cynosura* Say
 920 *Aeschna constricta* Say
 921 *Boyeria vinosa* Say
 922 *Cordulegaster erroneus* Hagen
 923 *Enallagma hageni* Walsh
 924 *Argia putrida* Hagen
 925 *Lestes unguiculata* Hagen
 926 *L. rectangularis* Say
 927 *Calopteryx maculata* Beauv.

MAY FLIES, Ephemera

- 928 *Ephemera ?simulans* Walk.
 929 *Pentagenia vittigera* Walsh
 930 *Callibaetis ferruginea* Walsh

BRISTLETAILS, SPRINGTAILS, Thysanura

- 931 **Bristletail fishmoth, Thermobia furnorum** Rov.

PROTECTIVE MIMICRY (932-46)

Collection prepared and mounted by the Denton Bros., Wellesley Mass.

932 *Danais tytia* Gray (India). This insect is protected from the birds by an unpleasant odor or taste, and it is mimicked by 933, which is not distasteful to birds.

933 *Papilio agestor* Gray (India). This insect departs widely from the general appearance of most of its close relatives. Its resemblance to 932 undoubtedly protects it from molestation by birds.

934 *Hebomoia glaucippe* Linn. (China). Under surface; note its resemblance to the skeleton of a leaf.

935 *Hypolimnas misippus* Linn. (India). The female mimics 937, which is protected from birds by an unpleasant odor or taste. Compare with the male, 939.

936 *Erebomorpha* sp. (India). Note light and shadow effect, which is probably protective.

937 *Danais chrysippus* Linn. (India). Protected by an unpleasant odor or taste and mimicked by 935.

938 *Hebomoia glaucippe* Linn. (China). Upper surface; compare with 934.

939 *Hypolimnas misippus* Linn. (India). Male, not protected by mimicry; compare with female, 935.

940 **Monarch butterfly**, *Anosia plexippus* Linn. (North America). A native, very common species, having an unpleasant odor or taste and therefore not eaten by birds. It is mimicked by 941.

941 **Viceroy**, *Basilarchia archippus* Cram. (North America). Mimics 940 and differs greatly in general appearance from its close relatives.

942 *Kallima inachis* Boisd. (India). Leaf butterfly, under surface; note resemblance to brown leaves and also the imitation of fungous spots.

943 *Kallima inachis* Boisd. (India). Leaf butterfly. One showing upper surface of wings; compare with 942. And the other showing a butterfly in its resting position on a bare twig, it resembling a brown leaf very closely when in this position.

944 *Attacus atlas* Linn. (India). The tip of the wings resembles a cobra's head.

945 *Catocala concubens* Walk. (North America). One specimen is spread, showing the highly colored hind wings and the other is mounted on a piece of bark in its resting position. Note how inconspicuous the latter is.

946 *Caligo* *sp.* (South America). The specimen is shown reversed, a position in which it resembles the head of an owl.

NEW YORK BEAUTIES (947-61)

This collection shows a few of our more beautiful native forms. Prepared and mounted by Denton Bros., Wellesley Mass.

947 **Red admiral**, *Vanessa atalanta* Linn. Under surface; compare with 950, showing the upper surface of the same insect.

- 948 Mountain silver spot, *Argynnis atlantis* Edw.
- 949 Black swallowtail, *Papilio polyxenes* Fabr. Under surface; compare with 952.
- 950 Red admiral, *Vanessa atalanta* Linn. Upper surface; compare with 947.
- 951 Regal fritillary, *Speyeria idalia* Drury.
- 952 Black swallowtail, *Papilio polyxenes* Fabr. Upper surface; compare with 949.
- 953 Eight spotted forester, *Alypia 8-maculata* Hübn. A common species about grapevine and Virginia creeper.
- 954 Luna moth, *Tropaea luna* Linn. A somewhat common moth.
- 955 Imperial moth, *Basilona imperialis* Drury. A rare moth in New York state.
- 956 *Catocala nubilis*, Hübn.
- 957 Mourning cloak butterfly, *Euvanessa antiopa* Linn. Very common, and in some sections of the state it is a serious pest of willow, poplar and elm trees.
- 958 *Triptogon modesta* Harris
- 959 *Thyreus abbotii* Swains
- 960 Io moth, *Automeris io* Fabr.
- 961 Promethea moth, *Callosamia promethea* Drury.

TECHNICAL COLLECTION (962-1021)

PREPARED BY C. S. BANKS

Cyanid bottles

- 962 Empty bottle
- 963 Bottle with cyanid
- 964 Bottle with cyanid and plaster
- 965 Bottle complete
- 966 Paper shavings in bottle
- 967 Chloroform bottle with brush
- 968 Collecting vials
- 969 Pill boxes

Butterfly papers

- 970 First fold
- 971 Second fold
- 972 Butterfly in position

- 973 Closed fold
- 974 Insect pins
- 975 Pin holder
- 976 Pinning block
- 977 Collecting net showing construction. For model *see* wing frame and wall.
- 978 Dip net, *see* model on wall
- 979 Mounts for small insects
- 980 Capsule mount
- 981 Glue for mounting insects¹
- 982 Coleoptera mount
- 983 Hemiptera mount
- 984 Orthoptera mount
- 985 Locality and date labels

Mount by Denton method

- 986 Plaster cast
- 987 Mount complete

Alcoholic preparations

- 988 Bottle with label
- 989 Bottle with pin
- 990 Bottle on block
- 991 Pinning forceps
- 991a Forceps for handling insects
- 992 Sheet cork
- 993 Sheet peat
- 994 Relaxing device, *see* photograph in wing frame
- 995 Spreading apparatus
- 996 Spreading pins with handles
- 997 Strips used in spreading, mica, paper and glass
- 998 For spreading Microlepidoptera
- 999 Dr Lintner's device
- 1000 For spreading Hymenoptera
- 1001 For spreading Coleoptera

¹ Formula: Crush 75 to 100 grams of gelatin or clear glue, preferably the former, and put in a bottle with 100 cubic centimeters of commercial acetic acid (no. 8) and set in a warm place for three or more days, shaking occasionally. Then add 100 cc of water, 100 cc of 95% alcohol and 15 to 20 cc of glycerin. Operations may be hastened by heating the glue and acid in a water bath, but *great care* must be exercised if this is done.

For inflating larvae

- 1002 Larva on blowtube
- 1003 Drying ovens and tubes
- 1004 Wire mount on pin
- 1005 Wire mount complete
- 1006 Pocket lens
- 1007 Tripod lens

Insect pests of collections

- 1008 *Anthrenus verbasci* Linn.
- 1009 *A. verbasci* larva
- 1010 *Attagenus piceus* Oliv.
- 1011 *Dermestes lardarius* Linn.

Preventives and remedies for pests in collections

- 1012 Naphthalin cone
- 1013 Naphthalin ball
- 1014 Carbon bisulfid
- 1015 Verdigris on insect

Insect cases

- 1016 Green box
- 1017 Schmidt box
- 1018 Dr Lintner's Coleoptera box
- 1019 Corner Section insect case (United States national museum style)

Shipping devices

- 1020 Bottle in mailing tube
- 1021 Small box properly packed

FRAMED PHOTOGRAPHS

1022 "Bug house," where Dr Fitch did most of his work, Fitch's Point, Salem N. Y., photograph, 19 Sep. 1900.

1023 Asa Fitch M. D., entomologist State agricultural society, 1854-72.

1024 Residence of Dr Fitch, Fitch's Point, Salem N. Y., photograph, 19 Sep. 1900.

1025 Joseph Albert Lintner Ph.D., New York state entomologist, 1874-98.

1026 View of main portion of office of state entomologist, 1901.

Wing frames

1027 Photographs of private office of state entomologist, of the north wing and dark room in the general office, of trays of classified and unclassified insects. Table of correspondence during the past five years and a note on the state collection.

1028 Staff of the entomologic division of state museum. Table of Fitch reports, list of principal publications of state entomologist, and a note on additional publications.

1029 Blank forms used in office of state entomologist. Official paper, entomologic field station paper, official postal card, price list of publications, voluntary observer appointment blank, accession slip, receipt slip, locality and date label sheet, gummed labels, special printed labels, blank labels.

1030-31 Title pages of entomologic publications.

1032 Original figures from museum bulletins 26, 37 and a few others.

1033 Photographs of inflating, relaxing apparatus and work table in the general office.

1034 Pattern of butterfly net.

1035 Voluntary observer paper and list of voluntary observers for 1901.

1036 Map showing location of voluntary observers.

1037 Four anatomic plates, showing the structural details of *Chloropisca variceps* (fig. 7, 7th rep't), *Phora a garici* (pl. 2, 10th rep't), scorpion flies (pl. 4, 10th rep't) and of *Diplosis cucumeris* (pl. 2, 11th rep't).

1038 Miscellaneous plates as follows: upper austral life zone in New York (pl. 4, 11th rep't), cottonwood leaf beetle collecting machine (pl. 6, 11th rep't), illustrations of 17 year cicada (pl. 9 and 10, 12th rep't), and the great white leopard moth (pl. 1, 12th rep't).

1039 Three plates as follows: Work of forest tent-caterpillars in sugar orchard (fig. 4 in special paper on insects injurious to maple trees); forest tent-caterpillars on appletrees (pl. 15 and 16, 16th rep't).

1040 Miscellaneous plates as follows: gipsy moth (pl. 1, 16th rep't), palmer worm (pl. 2, 16th rep't), work of *Scolytus rugulosus* (pl. 14, 16th rep't), fumigating tent (pl. 13, 16th rep't).

1041 Shade tree pests as follows: maple and elm tree borers (pl. 7, 12th rep't), elm bark louse and work of elm leaf beetle (pl. 2, mus. bul. 27), spraying outfit in operation (fig. 3 in special paper on insects injurious to maple trees).

1042 Insects injurious to mapletrees: white marked tussock moth and forest tent-caterpillar (pl. 1 in special paper), leopard moth and maple sesian (pl. 2 in special paper), sugar maple borer, mapletree pruner and cottony mapletree scale insect (pl. 3 of special paper).

1043 Fruit tree and household pests: appletree tent-caterpillar (pl. 1), codling moth (pl. 3, 4), bedbug, red ant, larder beetle and croton bug (pl. 6). All the plates exhibited under this number were published in the transactions of the New York state agricultural society, 1899, and they illustrate a paper on injurious farm and household insects.

1044 Insecticides, results obtained with (pl. 4-7, 16th rep't).

1045 Insecticides, results obtained with (pl. 8, 9, 10 and 11, 16th rep't).

1046 Technical characters of scale insects, *Aspidiotus perniciosus*, *A. ancyclus*, *A. forbesi* and *A. ostreaeformis* (pl. 11-15 of Museum bulletin 46).

1047 Aquatic insects, four colored plates representing some of the more important insects occurring in the Adirondaacks (pl. 10-13 of Museum bulletin 47).

1048 Aquatic insects, two colored plates and two black and white plates illustrating methods of collecting and character of one locality (pl. 5, 6, 14 and 15 of Museum bulletin 47).

1049 Aquatic insects and their home (pl. 4, 9, 17 and 18 of Museum bulletin 47).

1050 Dragon flies and other insects (pl. 21, 23, 24 and 26 of Museum bulletin 47).

1051 Caddis flies and fish flies (pl. 27, 30-32 of Museum bulletin 47).

1052 Caddis flies and Diptera (pl. 33-36 of Museum bulletin 47).

PUBLICATIONS

Noxious, beneficial and other insects of the state of New York, reports 1-14, by Asa Fitch M. D., entomologist of the New York state agricultural society. Two volumes, half morocco.

Lintner entomologic publications, comprising Entomologic contributions 1-4; Report on the insect and other animal forms of Caledonia creek, New York; Report on the injurious insects of the year 1878; Insects of the clover plant; A new principle in protection from insect attack; Some injurious insects of Massachusetts; White grub of the May beetle; Our insect enemies and how to meet them; Late experiences with insects injurious to the orchard and garden, 1890; Report of the committee on entomology, 1891; Report of the committee on entomology, 1893; Report of the state entomologist for the year 1893. One volume, half morocco.

Injurious and other insects of the state of New York, reports 1-13, by J. A. Lintner, state entomologist. Four volumes, half morocco.

New York state museum bulletins

20 Elm leaf beetle in New York state, by E. P. Felt, acting state entomologist.

23 14th report of the state entomologist, by E. P. Felt, acting state entomologist.

24 Memorial of life and entomologic work of Joseph Albert Lintner Ph. D., state entomologist, 1874-98. Supplement to 14th report of the state entomologist, by E. P. Felt, state entomologist.

26 Collection, preservation and distribution of New York insects, by E. P. Felt, state entomologist.

27 Shade tree pests in New York state, by E. P. Felt, state entomologist.

31 15th report of the state entomologist, by E. P. Felt, state entomologist.

36 16th report of the state entomologist, by E. P. Felt, state entomologist.

37 Illustrated descriptive catalogue of some of the more important injurious and beneficial insects of New York state, by E. P. Felt, state entomologist. All the bulletins except no. 36 were bound in one half morocco volume.

EXPLANATION OF PLATES

PLATE 1

Hessian fly *Cecidomyia destructor* Say

A wheat plant showing an uninjured stalk at the left and one infested with the Hessian fly at the right. The leaves of the latter are dwarfed and withered and the stem is swollen at three points near the ground where the "flaxseeds" are located between the leaf sheath and the stem.

a Egg of Hessian fly greatly enlarged as are all figures except *e* and *h*

b Larva, its natural size indicated by the line beside it

c Puparium, "flaxseed" or pupal case

d Pupa

e Adult female ovipositing on leaf, natural size

f Adult female, very much enlarged

g Male, very much enlarged

h "Flaxseeds" in position between leaf sheath and stem

i Parasite, *Merisus destructor*, male, much enlarged

All from Packard, U. S. ent. com. 3d rep't, *b* drawn by Dr Riley, *d* and *f* by Mr Burgess, *a*, *g*, *e* and *i* by Prof. Packard.

PLATE 2

European willow gall midge

Rhabdophaga salicis Schrk.

FIG.

1 Breast bone of larva

2 Dorsal view of pupal case, showing setaceous processes

3 Distal segment of tarsus, showing claws and pulvillus from side

FIG.

- 4 Pulvillus
- 5 Two segments of antenna of male
- 6 Two segments of antenna of female. All very greatly enlarged

PLATE 3

Leopard moth

Zeuzera pyrina Linn.

- 1 Larva and castings
- 2 Empty pupal case
- 3 Female moth at rest. All on a badly bored piece of wood

PLATE 4

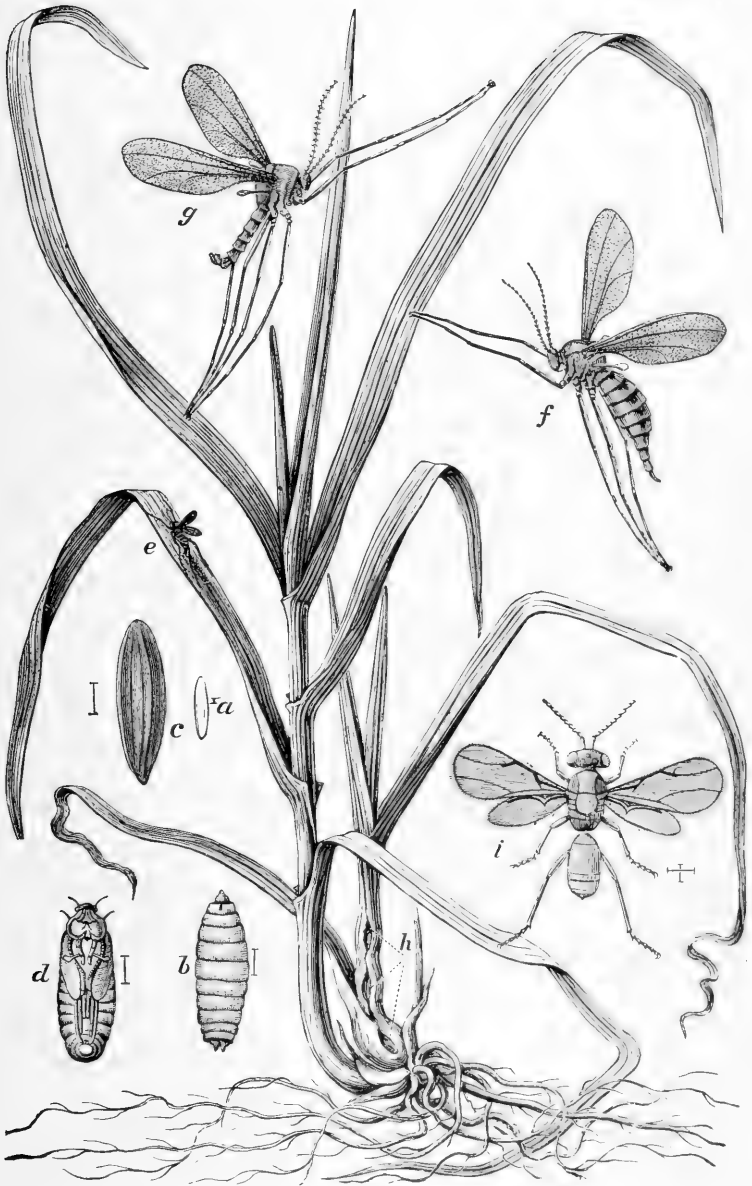
- 1 Gall of *Rhabdophaga salicis* Schrk. on European willow
- 2 *Lecanium nigrofasciatum* (After Pergande, U. S. dep't agric. div. ent. Bul. 18 new series '98. p. 27)
- 3 Rose scale insect, *Aulacaspis rosae* Sandb., on blackberry, enlarged
- 4 Male, female and young scale, very much enlarged
- 5 Birch leaf *Bucculatrix*, *Bucculatrix canadensisella*: *a* skeletonized leaf; *b* molting cocoon; *c* larva; *d* head of larva; *e* anal segments of larva; *f* same of pupa; *g* cocoon with extruded pupa skin; *h* moth—all enlarged. (From *Insect life*)

PLATE 5

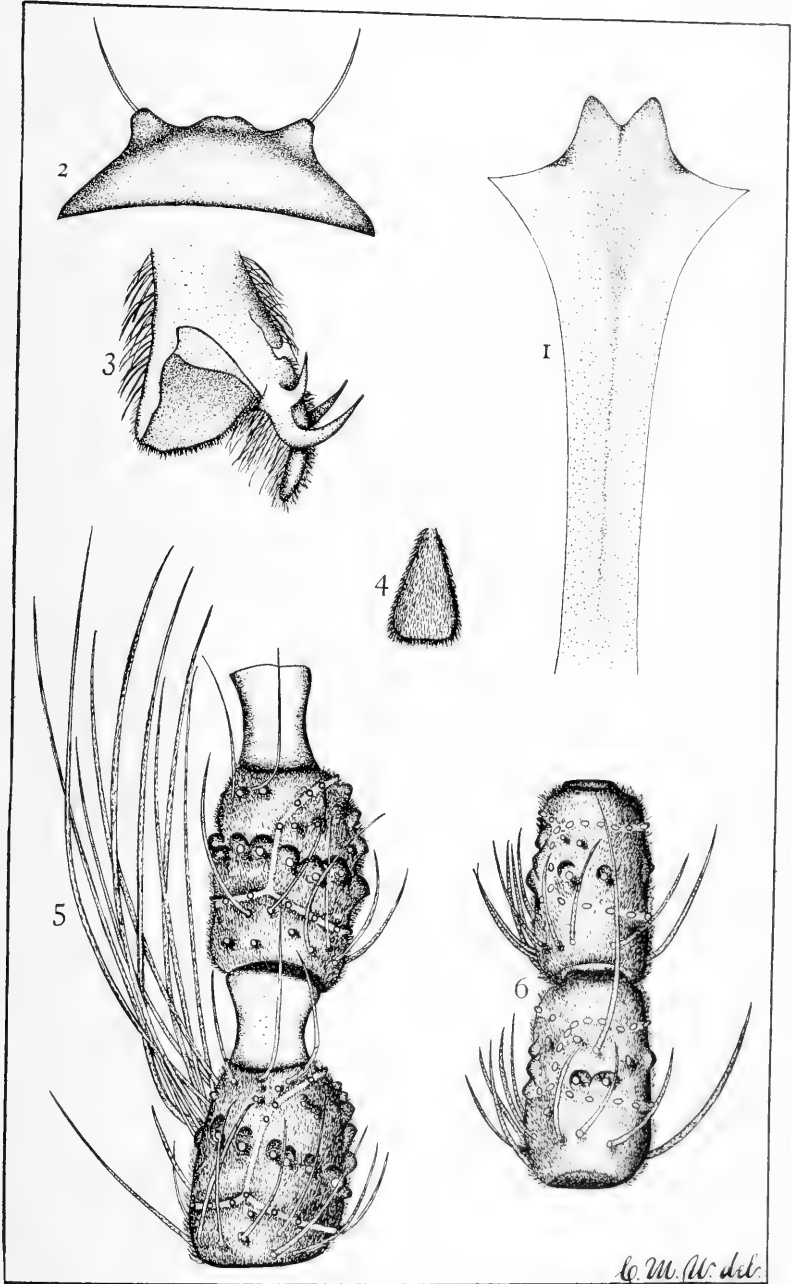
General view of experimental orchard showing thrifty appearance of young trees infested with San José scale, showing how the pest has been controlled by spraying. Photo 8 Oct. 1901

PLATE 6

Young orchard in bad condition on account of San José scale and yet it became infested later than the orchard represented on pl. 5 but prior to date had not been sprayed. Photo 8 Oct. 1901.



Hessian fly



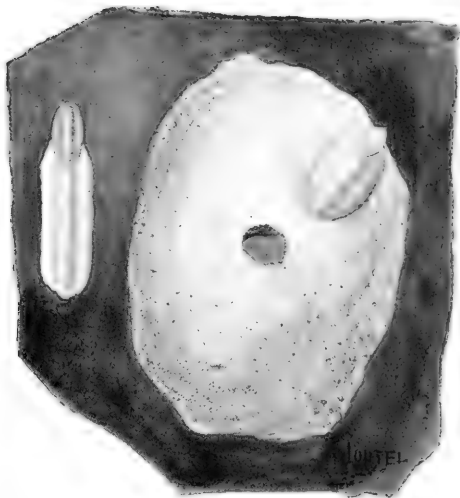
European willow gall midge



Leopard moth



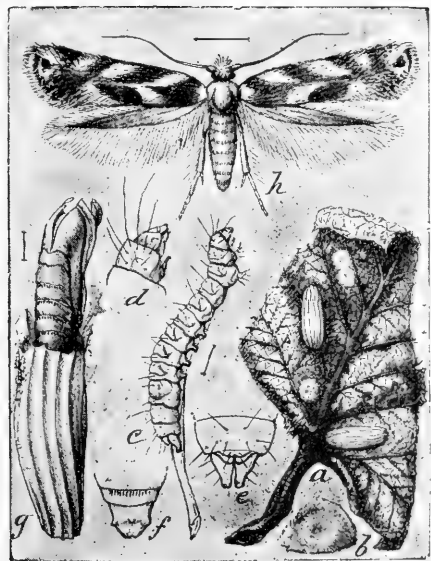
1



4



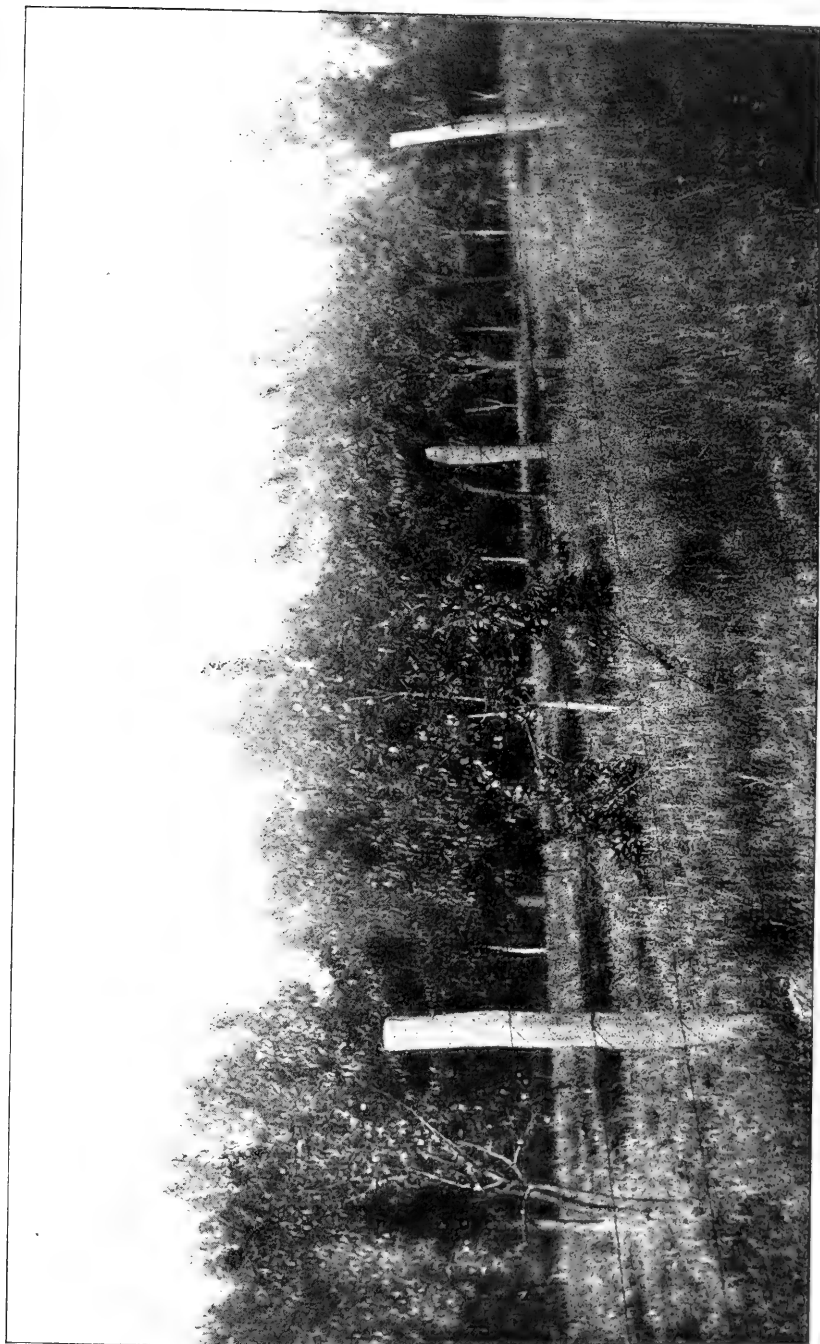
2



5



3



Experimental orchard, showing value of spraying, compare with pl. 6

Photo 8 Oct., 1901



Unsprayed, San José scale infested orchard, compare with pl. 5

Photo 8 Oct. 1904

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New York State Museum

MUSEUM PUBLICATIONS

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All publications are in paper covers, unless binding is specified.

Museum annual reports 1847–date. *All in print to 1892, 50c a volume, 75c in cloth; 1892–date, 75c, cloth.*

These reports are made up of the reports of the director, geologist, paleontologist, botanist and entomologist, and museum bulletins and memoirs, issued as advance sections of the reports.

Geologist's annual reports 1881–date. Rep'ts 1, 3-13, 17–date, O.; 2, 14-16, Q.

The annual reports of the early natural history survey, 1836-42 are out of print.

Reports 1-4, 1881-84 were published only in separate form. Of the 5th report 4 pages were reprinted in the 39th museum report, and a supplement to the 6th report was included in the 40th museum report. The 7th and subsequent reports are included in the 41st and following museum reports, except that certain lithographic plates in the 11th report (1891), 13th (1893) are omitted from the 45th and 47th museum reports.

Separate volumes of the following only are available.

Report	Price	Report	Price	Report	Price
12 (1892)	\$.50	16	\$1	19	\$.40
14	.75	17	.75	20	.50
15	1	18	.75		

In 1898 the paleontologic work of the State was made distinct from the geologic and will hereafter be reported separately.

Paleontologist's annual reports 1899–date.

See fourth note under Geologist's annual reports.

Bound also with museum reports of which they form a part. Reports for 1899 and 1900 may be had for 20c each. Beginning with 1901 these reports will be issued as bulletins.

Botanist's annual reports 1869–date.

Bound also with museum reports 22–date of which they form a part; the first botanist's report appeared in the 22d museum report and is numbered 22.

Reports 22-41, 48, 49, 50 and 52 (Museum bulletin 25) are out of print; 42-47 are inaccessible. Report 51 may be had for 40c; 53 for 20c; 54 for 50c. Beginning with 1901 these reports will be issued as bulletins.

Descriptions and illustrations of edible, poisonous and unwholesome fungi of New York have been published in volumes 1 and 3 of the 48th museum report and in volume 1 of the 49th, 51st and 52d reports. The botanical part of the 51st is available also in separate form. The descriptions and illustrations of edible and unwholesome species contained in the 49th, 51st and 52d reports have been revised and rearranged, and combined with others more recently prepared and constitute Museum memoir 4.

Entomologist's annual reports on the injurious and other insects of the State of New York 1882–date.

Bound also with museum reports of which they form a part. Beginning with 1898 these reports have been issued as bulletins. Reports 3-4 are out of print, other reports with prices are:

Report	Price	Report	Price	Report	Price
1	\$.50	8	\$.25	13	\$.10
2	.30	9	.25	14 (Mus. bul. 23)	.20
5	.25	10	.35	15 (" 31)	.15
6	.15	11	.25	16 (" 36)	.25
7	.20	12	.25	17 (" 53)	.30

Reports 2, 8-12 may also be obtained bound separately in cloth at 25c in addition to the price given above.

Museum bulletins 1887–date. O. *To advance subscribers, \$2 a year or 50c a year for those of any one division: (1) geology, including economic geology, general zoology, archeology and mineralogy, (2) paleontology, (3) botany, (4) entomology.*

Bulletins are also found with the annual reports of the museum as follows:

Bulletins	Report	Bulletins	Report	Bulletins	Report
12–15	48, v. 1	20–25	52, v. 1	35–36	54, v. 2
16–17	50 “	26–31	53 “	37–44	“ v. 3
18–19	51 “	32–34	54 “	45–48	“ v. 4

The letter and figure in parentheses after the bulletin number indicate the division and series number. G=geology, EG=economic geology, Z=general zoology, A=archeology, M=mineralogy, P=paleontology, B=botany, E=entomology, Misc=miscellaneous.

Volume 1. 6 nos. \$1.50 in cloth

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- 2 (B1) Peck, C: H. Contributions to the Botany of the State of New York. 66p. 2pl. May 1887. [35c]
- 3 (EG1) Smock, J: C. Building Stone in the State of New York. 152p. Mar. 1888. *Out of print.*
- 4 (M1) Nason, F. L. Some New York Minerals and their Localities. 20p. 1pl. Aug. 1888. 5c.
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Volume 2. 4 nos. [\$1.50] in cloth

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Volume 3. 5 nos.

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- 5 Clarke, J: M. & Ruedemann, Rudolf. The Guelph Formation and Fauna of New York State. *In preparation.*
- 6 Clarke, J: M. The Naples Fauna in Western New York. *In preparation.*

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