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EPHRAIM PORTER FELT State Entomologist

Bulletin 76

ENTOMOLOGY 21

19th Report of the State Entomologist

ON

INJURIOUS AND OTHER INSECTS

OF THE

STATE OF NEW YORK

1903

	PAGE
Introduction	91
General entomologic features.	91
Office work	92
Special investigations	92
Publications	93
Collections of insects	94
Nursery inspection work	95
Voluntary observers	96
Acknowledgments	96
Beneficial insects	97
Synopsis of certain genera of the Ophionini	97
Injurious insects	125
Notes for the year	130
Plant lice	130
Fruit tree insects	137
Grapevine pests	142
Garden insects	143
Grain and house pests	145
Notes for the year (*continued*)	
Shade trees and forest insects.	147
Beneficial insects	150
Experimental work against San José scale insect	151
Early spring or winter applications	151
Summer washes	159
Diseased and dying trees and insect attack	167
Voluntary entomologic service	173
List of publications of the entomologist	192
Insect exchange	200
Species received in exchange	201
Exchange list	207
Contributions to collection	213
Explanation of plates	221
Plates 1–4	face 222
Index	223

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Bulletin 76

ENTOMOLOGY 21

19th REPORT OF THE STATE ENTOMOLOGIST 1903

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 in the State of New York for the year ending Oct. 15, 1903.

General entomologic features. The season of 1903 will long be known on account of the abnormal abundance of plant lice of various species, which have not only been exceedingly destructive to fruit trees in particular but the prolongation of their depredations far beyond the usual date was specially injurious to young or recently set trees. The latter part of the summer the San José scale, Aspidiotus perniciosus Comst., bred so excessively that many trees were literally covered with half grown scale insects toward the end of the season. The depredations of the elm leaf beetle, Galerucella luteola Müll., have continued in the Hudson river valley though the spraying operations of recent years have reduced their numbers very largely in Albany and Troy. An interesting feature of this insect's history was its presence in excessive numbers at Saratoga Springs, where it would undoubtedly have caused severe injury had it not been for the prompt spraying instituted by the village authorities. The white marked tussock moth, Notolophus leucostigma Abb. & Sm., has caused less damage than usual in recent years

though it was generally present at Buffalo on a great many horse-chestnut trees, partially defoliating thousands. The fall web-worm, Hyphantria textor Harr., has, as a rule, been less injurious than in preceding years, except in a few localities.

Office work. The general office work has been conducted as in preceding years and has been marked by many more demands for information, indicating an increased interest. The determinations of scale insects for the commissioner of agriculture, in connection with the nursery inspection work of his department, has made somewhat extensive demands on the time of Assistant C. M. Walker, who has also had charge of most of the breeding cage work. Many photographs of living insects or specimens of their work have been taken and a number of lantern slides added to the collection, greatly increasing its effectiveness in illustrating popular lectures. It is gratifying to record that there have been no changes in the office staff during the past year, and consequently the work has proceeded without interruption from this cause. Correspondence indicates a continued and healthy interest in our work, as is evidenced by the following figures: 2035 letters, 784 postals, 490 circular letters and 1109 packages were sent through the mail during the past year. The reduction from last year in the number of postals and packages is due to the fact that but three publications were issued during the present year against four in 1903, and the last issued was not available for distribution till very late, consequently a portion of the copies will be sent out next year. Mailing expenses have also been reduced by sending two or more publications by express, wherever that was economical, a total of 114 packages being shipped.

Special investigations. The lines of work begun in earlier years have been continued and considerable progress made. The grape-vine root worm, Fidia viticida Walsh, has been the subject of more extended investigations than last year, a large amount of exceedingly valuable data has been secured and we have demonstrated that collecting the beetles was a practical, the most reliable and probably the most economical method of controlling this pest. The details of this work will appear in a revised and extended bulletin on this insect. The experiments with insecti-

cides for controlling the San José scale have been carried on in the same orchard as in the past three years, and our earlier results with crude petroleum have been confirmed. Extended experiments with lime-sulfur washes have also been conducted at Warwick with very gratifying results. An extensive series of experiments with summer washes was made, Mr Walker having direct charge of the work and being responsible for most of the observations. A second instalment of the beneficial Chinese ladybeetle, Chilocorus similis Rossi, which may prove of value in suppressing this pernicious scale insect, was obtained from the United States Department of Agriculture last August and established in an infested orchard at Kinderhook. It is hoped that they will survive in this latitude and prove of great value in controlling this dangerous pest. The extended forest fires in the Adirondacks early in the season offered an excellent opportunity for investigating the connection between them and insect attack. The results of this work are given on a subsequent page. Our general studies of forest and shade tree insects have been continued and a number of valuable observations made.

The present year has been marked by the appearance of a second report by Dr Needham on aquatic insects, which consists of a series of valuable original articles by himself, supplemented by important papers from Messrs MacGillivray, Johannsen and Davis. Another report by Dr Needham, is now in preparation and will be devoted largely to a consideration of the May flies and midges (Chironomidae) of the State.

Investigations on our native mosquitos have been continued, resulting in material additions to our knowledge. Collections of these little insects have been made in different sections of the State, and it was possible for Assistant D. B. Young to spend two weeks at Long Island, working in cooperation with the North Shore Improvement Association, which has become well and favorably known to all interested in this line of effort on account of its very efficient operations in subduing these pests in the vicinity of New York city.

Publications. The principal publications of the entomologist, to the number of 70 are listed under the usual head. The more

important of those issued during the past year are the following: *Grapevine Root Worm* (Museum bulletin 59), *18th Report of the State Entomologist 1902* (Museum bulletin 64) and *Aquatic Insects in New York State* (Museum bulletin 68). In addition, the entomologist has contributed an important paper on insects injurious to pine and oaks, for the seventh report of the Forest, Fish and Game Commission, and one on insecticides for the report of the Colorado State Board of Horticulture for 1902.

Other important publications, which are either in the printer's hands or practically completed, are as follows: *Grapevine Root Worm,* a revised and extended edition of Museum bulletin 59, mentioned above. A monograph of the genus Saperda, which includes some of our most destructive borers, has been prepared by the entomologist in association with Mr L. H. Joutel of New York city, and will form a small bulletin of about 80 pages illustrated by 7 colored plates. Dr Needham's third report, mentioned in the preceding paragraph, is practically completed and will be an extended work about the same size as Museum bulletin 68. There is also a memoir on insects injurious to forest and shade trees, an extensive publication illustrated with many halftones and 16 colored plates, treating specially of those forms which are destructive to shade trees.

Collections of insects. Very large additions have been made to the state collections during the past season. They are specially desirable because a considerable proportion have come from other sections of the State. Mr Young spent several weeks in the Adirondacks in special work on forest insects, and he has collected at intervals throughout the season in cooperation with the Vassar Brothers Institute, at Poughkeepsie, and also at Long Island while engaged on mosquito investigations. The results have been large and exceedingly valuable additions to the state collections. Much progress has been made in arranging insects previously collected. The Lepidoptera, which are in the care of Mr Walker, have all been referred to the principal groups and many determined specifically. He has also arranged the Coccidae, now represented by 98 species and a host of specimens, while Mr Young has been able to do considerable systematic work on the Tenthre-

dinidae, Ichneumonidae, Syrphidae, Tachinidae and Capsidae, besides making material progress in arranging the Coleoptera which, it is gratifying to state, are already in a fairly satisfactory condition. The exhibit collection has received valuable additions from time to time, and in all of our collecting an effort has been made to secure material desirable for this purpose. The museum was kindly remembered during the present year and bequeathed a small collection of insects by Miss Ellen L. Baker of Middle Granville N. Y.

The past season a system of exchange was inaugurated with most excellent results. The museum possesses large series of certain species. Lists were prepared and sent to entomologists in different sections of this and other countries with a request for exchanges, and as a result some exceedingly valuable additions have been made to the collection with practically no cost to the museum. The details of these exchanges together with a list of species available for this purpose will be found under a separate head.

Nursery inspection work. Owing to the Virginia authorities refusing in the fall of 1902 to accept nursery inspection certificates issued by the State Department of Agriculture, even though officially indorsed by us, other means had to be devised to aid those who wished to ship nursery stock into Virginia. The state entomologist of Virginia was willing to accept a certificate based on inspection by an assistant working under our direction, and as an accommodation to our nurserymen, it was arranged to send an assistant to make supplementary inspections of only that stock which was destined for Virginia, the parties benefited to pay his traveling expenses. Mr C. M. Walker was detailed for this work, which occupied nearly two weeks. It is very gratifying to state that the regular inspectors, in whom we have utmost confidence, kindly aided Mr Walker in his work. Mr H. C. Peck and Mr J. J. Barden, in whose territory most of the inspecting was done, were specially helpful. The following is a list of firms to whom these nursery certificates were issued between Oct. 21 and Nov. 1, respectively: Mt Hope Nurseries, Western New York Nursery Co., Thomas Bowman & Son, A. L. Wood, Allen Nursery Co., H. S. Taylor & Co., Charlton Nursery Co., all of Rochester; Sheeren

Wholesale Nurseries, George A. Sweet Nursery Co., Rogers Nursery, all of Dansville; Brown Bros. Co., Chase Bros. Co., First National Nurseries, Perry Nursery Co., J. B. Nellis & Co., all of Brighton; Lewis Roesch, T. S. Hubbard Co., G. S. Josselyn Co., all of Fredonia; Knight & Bostwick, Emmons & Co., and C. W. Stuart & Co., all of Newark.

Voluntary observers. The work of the voluntary observers begun in 1899 has been continued, but owing to an unusually dry spell in the early part of the season followed by excessive rains, there has been comparatively little to report except injuries by plant lice, a group of insects on which the voluntary observers are not well qualified to report. As a consequence, there are not so many records as have been made in earlier seasons, though the sum total of their observations amounts to a material addition to our knowledge concerning some very important injurious insects. Summaries of these reports are published under the usual head.

Acknowledgments. The untimely death of our highly esteemed and gifted associate, the late Prof. V. H. Lowe of the State Agricultural Experiment Station at Geneva, is a source of deep regret and a severe loss to the science he loved so well. The entomologist has been favored by the cooperation of a number of professional workers. To Dr L. O. Howard, chief of the division of entomology, United States Department of Agriculture, and his staff, special acknowledgments are due for the determination of a number of insects and for information regarding different species. Mr E. P. VanDuzee, of Buffalo, a well known authority on Hemiptera, has kindly identified all our Pentatomidae and a number of related forms, and we are indebted to Prof. Mel. T. Cook, of De Pauw University, Greencastle Ind., for the determination of many insect galls. The appreciation of our work by the many friends of the office is a source of pleasure, and the support given by those in authority is very gratifying.

Respectfully submitted

EPHRAIM PORTER FELT
State Entomologist

Office of the State Entomologist
Albany, Oct. 15, 1903

BENEFICIAL INSECTS

SYNOPSIS OF CERTAIN GENERA OF THE OPHIONINI

The following account of species belonging to various genera of this group is the result of a study, extending over some years, originally begun at Cornell University under the auspices of Prof. J. H. Comstock, to whom the writer is under deep obligations for assistance. The original assignment covered the species placed in this genus by Cresson, and owing to many other matters demanding attention, we have reluctantly decided to publish our results without attempting to extend our studies so as to include all the members of this group, particularly because of lack of time, and specially since a number of genera are represented only by foreign species. We also take this opportunity to express our obligations to Dr W. H. Ashmead, curator of the Hymenoptera, United States National Museum, who in recent years has kindly loaned us specimens and afforded material aid in our systematic study.

This group includes some of our larger and more common parasites, and to the species comprising it much credit is due for material aid in controlling a number of our insect pests. For example the long-tailed Ophion, E r e m o t y l u s m a c r u r u s Linn. is a common parasite of large cecropia larvae and allied species. These large caterpillars are rarely abundant enough to attract attention by their ravages, and one reason for this is undoubtedly the activity of their parasites, foremost of which stands the long-tailed Ophion.

Value as parasites

The other species of this group have been reared from a large number of hosts, and there is no reason for regarding several of them as of less value than E r e m o t y l u s m a c r u r u s Linn. The following statistics will give some idea of their abundance and, as the life of the host with its attendant possibilities is destroyed as each develops, they also give some idea of the economic value of the species. Six trap lanterns were in operation during the entire season of 1889 at Cornell University for the purpose of ascertaining the value of lights for destroying insects, and nearly

600 examples of ophionids were taken. Two species were well represented in this lot. There were none of the long-tailed Ophions, hence the figures give no idea of the relative abundance of this parasite or of the other species not represented. The one by far the most abundant was Ophion bilineatum Say, the two-lined Ophion, which was represented by 450 examples. The species next in abundance was Ophion tityri Pack., which was represented by 118 examples, while Eniscopilus purgatus Say was represented by but 23 individuals. It will be noticed that the two species taken most abundantly are not well represented in most collections and but little is known of their habits. This record does not in the least reflect on the value of these two as parasites. It is possible that both are equally efficient in their own fields and it is most probable, seeing that they are crepuscular or nocturnal in habit, that they breed largely in larvae which rarely fall into the hands of the collectors. The two-lined Ophion has been reared mostly from arctians or noctuids. Though records of this character are still far too scarce to permit the formation of a positive opinion, it is likely that this species does material service in keeping larvae belonging to these two families in check. The observations are even more meager regarding Ophion tityri. Here is certainly a field for investigation.

General habits

The different members of this group may usually be seen flying slowly about shrubbery and in the grass during bright days from early May till into October. In cloudy and wet weather they seek some sheltered place—at least this is true of the diurnal species. The long-tailed and the purged Ophions are the two taken most commonly in the day, and they are the best represented in most collections examined. The trap lantern record would appear to indicate a great preponderance of the two-lined Ophion. This must be ascribed to the crepuscular or nocturnal habits of the latter form. The females are the more active and are more abundant in collections. This might be expected, as on her devolves the labor of searching out a suitable nidus for

her eggs. The large proportion of females is well shown in the trap lantern record, where but 87 males were taken to 485 females. The great activity of the females and the large number of them attracted to lights must diminish materially the value of the trap lantern as a means of destroying insect pests.

Oviposition and larval habits

The females possess a sharp ovipositor which is capable of inflicting a slight wound. Its sharpness appears to be mainly for defensive purposes, as the eggs are deposited usually on the skin of the host, to which they firmly adhere by means of a cement or glue extruded at the moment of oviposition. The deposit of the egg by Eremotylus macrurus has been graphically described by Trouvelet as follows[1]: "When an Ichneumon detects the presence of a worm, she flies around it for a few seconds, and then rests upon the leaf near her victim; moving her antennae very rapidly above the body of the worm, but not touching it, and bending her abdomen under the breast, she seizes her ovipositor with the front legs, and waits for a favorable moment, when she quickly deposits a little oval white egg upon the skin of the larva. She is quiet for some time and then deposits another upon the larva, which only helplessly jerks its body every time an egg is laid." Eight to ten eggs are laid in this manner. A few days later they hatch and the larvae make their way under the skin of their victim, feeding on the fatty portions of the host at first, but later most of the tissues are devoured. The miserable victim of these parasites drags out a weary existence and usually perishes in the pupal state, rarely before. As a single larva will provide sustenance for the development of but one or two parasites, the weaker ones perish.

There is on the front tibia of Ophion an articulated, apical spine, a structure common to many Hymenoptera, which is possibly connected with the method of oviposition narrated above. This articulated spine is curved toward the tarsus near the apex, and might consequently be used for holding the ovipositor, be-

[1]1868 Am. Nat. 1 :89-91.

cause when apposed to the tarsus the bend is such as to allow the ovipositor to pass easily through a space between the two. It is worthy of note in this connection, as showing the method of depositing eggs by an insect belonging to the same family, that Thalessa has been seen ovipositing in a similar manner by reliable observers.[1]

Pupation and final transformations

The larva of Eremotylus macrurus usually pupates within the cocoon of its victim. As this species preys largely on the saturnians, the larvae of which spin stout cocoons, the grub of the parasite on emerging from the remains of its victim finds itself in a well protected cocoon, and consequently has no need of looking for a more secure place in which to undergo its final transformations. The same habit is probably common to other species infesting hosts spinning a stout cocoon, as, for example, Erem. arctiae when preying on these moths. The cocoons of Eniscopilus purgatus are found in the soil or under shelter near where its host has transformed. From the lack of evidence to the contrary, it may be presumed that such is the general habit of all the species infesting larvae that do not spin stout cocoons before pupation.

Very few notes exist on the duration of the pupa state in this genus. Riley states that the imagos of Erem. macrurus commonly emerge in the spring, and rarely come forth in the autumn. This would apparently indicate that the normal habit of this insect is to pass the winter in the pupal stage. An example of Enis. purgatus has been known to pupate July 24, the imago emerging Sep. 13.

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[1] 1888 Lintner. Ins. N. Y. 4th Rep't, p.40-41.

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These are references to the genus only, as defined by Cresson in 1887.

Synopsis of genera treated

a Cubitodiscoidal nervure irregularly thickened, never appendiculate
b Yellowish chitinous spots in cubitodiscoidal cell.....Eniscopilus *Curtis*
bb No such spots in cubitodiscoidal cell.....Eremotylus *Forster*
aa Cubitodiscoidal nervure never irregularly thickened, usually appendiculate
b Face normal.....Ophion *Gravenhorst*
bb Face elongated.....Genophion *Felt*

Synopsis of species of Eremotylus

a Cubitodiscoidal vein usually strongly sinuate; hooks of hind wings 13-15; male clasps rather long, subrectangular, obtusely rounded at the apex.....macrurus Linn.
aa Cubitodiscoidal vein nearly arcuate; first and second recurrent nervures nearly equal; hooks of hind wing 7-9; male clasps subrectangular, acutely rounded.....arctiae Ashm.
glabratus Say[1]

Eremotylus macrurus Linn.

Long-tailed Ophion

This, the largest American species of the genus, is closely allied to Erem. arctiae Ashm., which has been confused with it in collections. The two species are easily separated from the others of the genus by their considerably larger size; the smallest being perceptibly larger than the largest of the other species, excepting

[1]See account of this species, p.106.

Ophion fuliginipennis Felt, which belongs in a different group. Erem. macrurus may be separated from Erem. arctiae by its larger size, by the fulvous tinge of the wings and veins, by the second discoidal nervure being nearly twice the length of the first, and by there being from 13 to 15 hooks on the hind wings. Other differences are detailed in the description of Erem. arctiae.

Habits and life history. This species is an active, diurnal insect, being rarely if ever attracted to lights. It is the one most commonly bred from the large saturnians, and is frequently referred to as a parasite of one or more of them. Its egg-laying habits and life history, so far as known, have been described in a preceding paragraph. It has also been recorded as bred from some of the arctians, but it is probable that some of these records really pertain to Erem. arctiae. Dr C. M. Weed has recorded an instance in which 30 out of 50 pupae of Samia columbia Smith were parasitized by this insect. The unusual abundance of Callosamia promethea Dr. is recorded in *Insect Life,* 2:383, and also the interesting fact that fully two thirds of the pupae harbored this parasite. The observations of Dr Riley show that this insect usually emerges in the spring, though occasionally individuals come forth in the autumn.

This parasite has been reared from the following insects: Isia isabella Abb. & Sm., Philosamia cynthia Drury, Callosamia promethea Drury, Samia columbia Smith, Samia cecropia Linn., Telia polyphemus Cram., Automeris io Fabr. and Apatelodes torrefacta Abb. & Sm.

Description. Fulvo-ferruginous, stigma almost obsolete; marginal nervure sinuate, thickened toward the stigma; size large; body 31 to 38 mm long; wing spread 43 to 56 mm. Head small, antennae nearly as long as the body; ocelli prominent, black; head yellowish posteriorly; eyes black, rather small; mandibles bidentate, tipped with black. Mesothorax convex; scutellum and postscutellum prominent; anterior portion of metathorax depressed; posterior portion rugose, limited anteriorly by a transverse carina; lateral carinae present. Wings hyaline; marginal nervure thickened, sinuate near the small stigma; cubitodiscoidal nervure never appendiculate, usually strongly sinuate; third dis-

coidal cell considerably wider at apex than base; hooks on hind wings 13 to 15. Legs long, honey yellow. Abdomen long, strongly compressed, usually darker at tip. Male claspers rather long, subrectangular, obtusely rounded at apex.

Described from 10 examples.

Cocoon. The larva leaves the shriveled remains of its victim when full grown and pupates within the cocoon spun before the demise of its host. The cocoon is tough, oval, about 32 mm long and 17 mm broad, and occupies the larger portion of that spun by its prey. It is composed of silk agglutinated by a dark secretion. Exteriorly it is a dark brown color, with a faint yellowish or golden band around the center. The interior is thinly lined with a transparent substance and possesses a brilliant metallic luster.

Distribution. The recorded distribution of this insect is from New England to California and from Canada to Texas, indicating that the species ranges over practically the whole of the United States and north into Canada. It has been reported from the following localities: Canada, New England, New York, New Jersey, Pennsylvania, District of Columbia, Virginia, Louisiana, Illinois, Missouri, Nebraska, Colorado, Texas, Nevada and California.

Specimens have also been examined from the following localities: Ottawa, Canada [Harrington]; New York city [Joutel]; Dutchess county, N. Y. and Rock Creek park, Washington D. C. [U. S. Nat. Mus.] and from Malden and Amherst Mass. [Fernald].

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1887 **Waterhouse.** Ent. Soc. Lond. Proc. p.33 (Parasite of Callosamia promethea)
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Eremotylus arctiae Ashm.

This species is by no means rare, though not recognized as a distinct form till 1890 owing to its having been confused with Erem. macrurus, which it closely resembles. A critical examination of the material in the state collection, Dr Lintner's private collection, and that from Cornell University, lent by Professor Comstock, has resulted in the finding of several examples of this species. Two specimens were taken in the trap lanterns at Cornell; one Aug. 3 and the other Aug. 22, 1889. Owing to the kindness of Messrs Howard and Ashmead, we have been permitted to examine a type of this species.

Hosts. This species is parasitic mostly on some of the arctians, though it has also been reared from saturnians. The following hosts are known: Ecpantheria deflorata Fabr., Diacrisia virginica Fabr., Automeris io Fabr. and Callosamia promethea Drury.

Description. The following is Mr Ashmead's description:

In Erem. macrurus, the wings have a decided fulvous tinge and the veins are fulvous; the second recurrent nervure is about twice as long as the first recurrent nervure, the third discoidal cell, therefore, is much wider at apex than at base; in Erem. arctiae, the wings are entirely without the fulvous tinge and the basal nervure, tips of median and discal nervures vary from brown to black, or piceo-black; the second recurrent nervure is only slightly longer than the first recurrent nervure, the cubital nervure being arcuate and the third discoidal cell, therefore, is about as wide at apex as at base; in Erem. macrurus, the transverse metathoracic carina is always more or less distinctly sinuated at the middle, in Erem. arctiae it is straight. In Erem. arctiae the hooks on the hind wings vary from seven to nine; in Erem. macrurus they are from 13 to 15; in the former the claws are pectinate; in the latter simple.

Male 26 mm long, wing expanse 35 mm; female 20 to 28 mm long, wing expanse 36 to 40 mm.

Figure 6 on plate 2 represents the wing characters of Erem. macrurus. In Erem. arctiae the cubitodiscoidal nervure is arcuate; in the type examined it was a nearly perfect arc, but in other specimens there was a slight tendency to the

sinuous course usually so marked in Erem. macrurus. The form of the third discoidal cell in the type was a little more regular than in our specimens and the first and second recurrent nervures were more nearly of an equal length. The wings of Erem. arctiae appear to be proportionately wider than in Erem. macrurus. In a study of examples of Erem. macrurus, I find the claws pectinate as well as in Erem. arctiae. The claspers of the male in the former species are rather long, subrectangular and obtusely rounded at tip, while in the latter they are subtriangular and acutely rounded at tip.

Distribution. This species is probably as widely distributed over this county as is Erem. macrurus. It is known to occur in New York, New Jersey, District of Columbia, Alabama, Mississippi and California, and specimens are before the writer from the following localities: Ottawa, Canada [Harrington]; Malden and Amherst Mass. [Fernald]; Michigan, Onaga Kan., Santa Cruz mountains and bred from Halisidota agassizii by Coquillett, Los Angeles Cal. [U. S. Nat. Mus.] There is a specimen from Pennsylvania and one from Texas in the Museum of Comparative Zoology, Cambridge Mass.

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1896 **Ashmead, W. H.** Am. Ent. Soc. Trans. 23:192 (Original description)

Eremotylus glabratus Say

This species is apparently quite closely related to Erem. arctiae Ashm. and it is possible that this latter is a synonym of Say's species but that can be determined with certainty only by examining the type, which is apparently not in existence. A small example of Erem. arctiae corresponds very well indeed with the original description of this rare form. There is a cocoon in the Harris collection in the rooms of the Boston Society of Natural History, labeled "Ophion glabratum" but no

adult accompanies it though a specimen of O. bilineatum Say was in close proximity to the cocoon. There is apparently nothing in that collection which can be used in the identification of this species. A specimen in the United States national collection has been labeled by Dr Ashmead as Eremotylus glabratus Say. It corresponds very closely with the description of Erem. arctiae. The most apparent differences are in its small size and the comparatively slender marginal or radial nervure with no distinct angle or tooth near the stigma, a character which is usually well marked in both Erem. macrurus Linn. and Erem. arctiae.

This species has undoubtedly been erroneously identified in a number of collections and the following references, except that of its original describer, in all probability relate to something else. Prof. G. C. Davis some years ago informed me that but one individual of this species was known to be in existence and that was in his possession. Say's original description of this insect is reproduced below:

Honey yellow; a glabrous spot in the large cubital cellule.

Body dull honey yellow; head bright yellow; antennae, mouth and stemmata honey-yellow; eyes blackish; wings, first cubital cellule beyond its middle with a longitudinally oval glabrous space, but destitute of any opaque spot; metathorax transversely wrinkled near the petiole of the abdomen.

Length about $\frac{4}{5}$ inch.

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1899 —— Ins. N. J. sup. State Bd Agric. 27th Rep't, p.580 (Listed)

Table for separation of species of Eniscopilus

a Larger chitinous spot in glabrous area of cubitodiscoidal cell, not appendiculate.....purgatus Say

aa Larger chitinous spot in glabrous area of cubitodiscoidal cell, appendiculate

b Chitinous process extending from larger chitinous spot along the posterior margin of the glabrous area and partly around its distal portion. Male clasps obtusely rounded.....arcuatus Felt

bb Chitinous process from the larger spot not extending beyond the middle of the glabrous area. Smaller chitinous spot nearly circular and slightly posterior to the center of the glabrous area....
appendiculatus Felt

Eniscopilus purgatus Say

This species is easily recognized by the two opaque, chitinous spots in the cubitodiscoidal cell. The great tenuity and length of the basal two abdominal segments is very marked, and is frequently of service in identifying the insect, though this is also true of the much rarer Enis. arcuatus and Enis. appendiculatus. It is the species of this genus most frequently found in the East while collecting in the daytime and the one most common in collections.

Life history and habits. The imagos fly from the last of June till the last of September. They are diurnal and probably crepuscular in habit since they are attracted to lights to a certain extent, as is shown by the trap lantern experiments conducted at the Cornell University Agricultural Experiment Station in 1889.

Trap lantern records

	1889																			1892			
	JUNE				JULY							AUG.				SEP.			Total	JULY		AUG.	Total
	20	22	26	28	1	5	18	20	21	23	24	15	20	21	27	8	11	14		12	30	19	
Male.....	1	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	3	....	1	.....	1
Female..	1	1	2	1	...	1	1	2	2	...	1	1	1	2	1	1	1	1	20	1	....	2	3

It will be seen by examining the record for 1889, that there are three distinct periods, separated by a space of about two weeks, in which this species was taken. Thus none were captured between July 5 and 18, July 24 and Aug. 15. These two nonproductive periods may have been caused by climatic conditions, though it is hardly probable that unfavorable weather of any kind would prevent the species from flying by night for 13 consecutive days, to say nothing of the other period of three weeks. It may be that this periodicity indicates three broods or at least

periods when the imagos are more abundant, but in the absence of more data nothing but a surmise can be advanced.

The large number of females taken in the trap lantern reduces its value as a means of destroying noxious insects. Dr Packard observed that the bean-shaped egg of this insect was attached to the skin of the larval host by a pedicle, and that the newly hatched grub does not entirely leave the eggshell till it has eaten a hole into the side of its victim. It would therefore appear as though the sharpness of the ovipositor was largely for defensive purposes. The females can inflict a slight sting that will smart for half a minute or more, but the pain is by no means severe.

Hosts. This insect has been most frequently brought to notice as a parasite of the very destructive army worm, Heliophila unipuncta Haw. on which it is a very efficient check. The army worm was abundant in many localities throughout the country in 1896, when the numerous oblong, silken cocoons of this parasite attracted Professor Lugger's attention in Minnesota fields infested by army worms. This is the best evidence obtainable of its value as a parasite. We have reared it from the zebra caterpillar, Mamestra picta Harr. another injurious species, the grub emerging from the larva and pupating July 24, the adult appearing Sep. 13. Records indicate this to be one of the most valuable species of the genus, since it preys on several insects of considerable economic importance. It has been reared in addition to those named above, from Mamestra trifolii Rott, Scoliopteryx libatrix Linn., Schizura concinna Abb. & Sm., and S. unicornis Abb. & Sm. It has also been bred from a dipterous Solidago gall and several unidentified lepidopterous larvae. It probably has a number of other hosts. We have also seen a specimen reared from the Polyphemus caterpillar, Telea polyphemus Cram., in the Museum of Comparative Zoology at Cambridge Mass.

Description. Fulvo-ferruginous; stigma small; two subtriangular, opaque chitinous spots in the cubitodiscoidal cell.

Head medium; antennae nearly as long as the body; ocelli black, about equidistant from each other and the eyes; dorsal and posterior portions of head yellow; mandibles bidentate and tipped

with black. Thorax sericeous; mesothorax convex; scutellum and postscutellum prominent; metathorax slightly depressed anterior of the transverse carina; lateral carinae distinct. Wings hyaline; marginal nervure thickened and slightly sinuate near the stigma; cubitodiscoidal nervure usually strongly sinuate but not appendiculate, its bulla scarcely one fourth the width of the third discoidal cell from its apex; two subtriangular opaque spots occur in the glabrous area of the cubitodiscoidal cell, the larger one with no arcuate continuation along the margin of the glabrous area, though a small chitinous line may be seen near the smaller spot.

Legs honey yellow; abdomen strongly compressed, darker at the tip; first and second segments remarkably long and slender; claspers of male subtriangular, obliquely truncate, acute posteriorly.

Length about 22 mm, wing spread about 26 mm. Described from numerous examples.

The cocoon is a silken, brown, tough, oblong oval object.

Distribution. The recorded distribution of this insect is as follows: New England, New York, New Jersey, Pennsylvania, Virginia, Carolinas, Florida, Alabama, Illinois, Indiana, Missouri, Iowa, Colorado, Arizona, Nevada, California and Canada. Examples of this species from Georgia, Oregon and Washington, in addition to some of the states named above, occur in the collection of the Academy of Natural Sciences at Philadelphia. Specimens of this species are now before the writer from the following localities: Kansas; California; Virginia; Fox Point, Alaska [Harriman Expedition '99]; Flatbush N. Y., Victoria Tex., St Louis Mo., Durham N. H., and Arizona, all being in the collections of the United States National Museum. Specimens from Colorado, Las Vegas N. M., Cheyenne Wy., and Michigan were lent to the writer by Professor Gillette. Specimens from New York were received from Mr L. H. Joutel, and Mr W. W. Harrington kindly sent examples from Grimsby Ont. (taken June 6), Toronto (taken July 27, Aug. 24 and Sep. 3), Winnipeg (taken in June), Osoyoos B. C. (taken in May) and from Ottawa, Canada. Specimens from Malden and Amherst Mass. (taken Aug. 1, 2, 12 and 21) were lent to us by Prof. C. H. Fernald. The species is doubtless distributed over the whole of the United States and the larger portion of Canada.

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Eniscopilus arcuatus Felt

This comparatively rare species may be easily separated from E. p u r g a t u s Say, with which it has heretofore been confused, by the well marked chitinous, usually yellowish, arcuate continuation of the larger opaque spot in the cubitodiscoidal cell. This structure extends along the posterior border of the glabrous area in that cell to a point beyond the smaller opaque spot. It may also be recognized by the bulla of the cubitodiscoidal cell being at a distance equal to one half the width of the third discoidal cell from the apex of the same [pl. 1].

This species was described in the February issue of *Psyche,* 1902, page 307–8, and its characterization is reproduced herewith:

Light fulvo-ferruginous, the larger opaque chitinous spot of the cubitodiscoidal cell with a distinct arcuate continuation extending along the hinder margin of the glabrous area and partly around the smaller chitinous spot.

Head medium, yellowish posteriorly, face yellowish, antennae slightly longer than the body; ocelli black, equidistant; mandibles bidentate, fuscus apically. Thorax, sericeous; mesothorax, convex; scutellum and postscutellum, prominent, the former yellowish; metathorax slightly depressed in front of the transverse carina; lateral carinae distinct. Wings hyaline, having hardly a trace of the fuscus visible in O p h i o n (E n i s c o p i l u s) p u r g a t u s Say; marginal nervure slightly thickened and sinuate near the small stigma; cubitodiscoidal nervure, weakly sinuate, not appendiculate; its bulla one half the width of the third discoidal cell from its apex; two subtriangular opaque spots in the glabrous area of the cubitodiscoidal cell, the larger one with a chitinous, usually yellowish continuation along the hinder margin of the glabrous area to a point beyond the smaller chitinous spot, which latter is anterior and lateral of the center of the glabrous area. Legs, honey yellow. Abdomen, strongly compressed, slightly darker at the tip, the first and second segments being very slender. The claspers of the male are rounded apically.

Length about 23 mm. Wing spread from 30 to 35 mm.

Habitat, Albany N. Y. May 6, 1876 [W. M. Hill]; Ithaca N. Y., July 16, 1889 [J. M. Stedman]; New York city [L. H. Joutel]; Malden Mass. [C. H. Fernald]; Poughkeepsie N. Y. [Young, collector]; South Britain Ct. 1884 [G. F. Pierce].

There are examples of this species from Cambridge Mass. in the collection of the Museum of Comparative Zoology, and from Georgia and New Hampshire in the collection of the Academy of Natural Sciences of Philadelphia. There is a specimen in the collections of the United States National Museum labeled "Coll. C. V. Riley," and one in the Bolter Collection at the University of Illinois from Illinois. Types are in the New York State Museum and also at Cornell University.

Eniscopilus appendiculatus Felt

This form is even rarer than the preceding. It was originally described from one specimen which came into my possession through the kindness of Dr J. B. Smith, New Brunswick N. J. This specimen probably came from New Jersey and is deposited as a type in the New York State Museum. A study of the collections of others has revealed two specimens in the collections of the United States National Museum, one marked "Collection C. V. Riley" and the other "From Selma, October 1880, W. H. Patton." This form is evidently southern in its habitat and it may be separated from the preceding species by the following characteristics which were given in the February issue of *Psyche,* 1902, page 308:

Light fulvo-ferruginous, larger opaque spot of the cubitodiscoidal cell with a small extension on its posterior angle. The smaller chitinous spot is nearly circular, light yellow in color and slightly posterior to the center of the glabrous area [pl. 2, fig. 4].

This species differs in addition to the above characteristics from the preceding one in having the cubitodiscoidal nervure slightly angled and not sinuate. It is a smaller form, having a length of 18 mm and a wing spread of about 27 mm.

Table of species of Ophion

a Wings hyaline
  b Body usually strongly compressed, eyes large, extending nearly to the base of the mandibles
    c Medium size, metathorax not areolated, male clasps subtriangular ..... bilineatum Say
    cc Small, metathorax usually strongly areolated, male clasps short, rounded apically..... tityri Pack.
  bb Body stout, not strongly compressed, eyes small, distant from base of mandibles

c Cubitodiscoidal nervure usually not appendiculate
d Ferruginous or fulvous.....bifoveolatum Brullé
dd Ferruginous varied with black and venter of mesothorax usually black .....nigrovarium Prov.
cc Cubitodiscoidal nervure appendiculate, appendix extending into second discoidal cell .....abnormum Felt
aa Wings subhyaline
b Wings distinctly ferruginous .....ferruginipennis Felt
bb Wings yellowish, fuscous along apical costal margin..costale Cress

Ophion bilineatum Say

Two-lined Ophion

This species, next to the long-tailed and purged Ophions, is the most abundant in collections and the one most frequently noticed in entomologic literature. It may be easily separated from the other more common forms by its medium to large size, strongly compressed abdomen, by the subtriangular, obliquely truncate male clasps and the appendiculate cubitodiscoidal nervure.

Life history and habits. Very little is recorded concerning the life history and habits of this species. Its comparative rarity in collections is probably explained by its crepuscular or nocturnal habits, since our trap lantern record indicates that it is one of the most abundant forms attracted to light.

Trap lantern records

1889

	JUNE		JULY	AUGUST											SEPTEMBER															
	4	30	3	1	4	21	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	11	12	13	14	15	16	17	18	19
Male.....	...	1	.....	..	..	..	1	..	..	..	..	1	1	2	..	2	..	1	..	1	..	4	2	..	..	1	..	2	..	4	..
Female..	1	...	1	1	1	1	3	1	4	4	4	1	1	5	12	20	6	8	9	1	3	13	3	8	37	32	14	12	59	17	25

	1889																	1892														
	SEPTEMBER										OCT.				AUG.	Total	MAY	JUNE	SEPTEMBER												Total
	20	21	22	23	24	25	26	27	28	29	30	1	2	5	10	22		20	28	11	14	16	19	20	23	24	25	30	
Male....	..	1	..	..	..	2	3	..	..	..	..	1	..	..	..	.....	30	.....	1	1	..	..	..	..	..	..	..	..	..	2
Female	21	14	2	1	7	18	17	2	3	3	11	9	1	1	1	2	420	3	.....	..	2	1	1	1	1	2	1	1	13

It will be seen by the above, that there is some indication of periodicity in the captures, though nothing but what might be caused by more or less favorable weather or the relative abundance of the insects. There is certainly no indication of more than one brood. It will be noticed that this species flies most abundantly from about the middle to the last of September, and may be found on the wing till nearly the middle of October.

Hosts. Very little is known regarding the species on which this insect preys. The record is so meager that one can only surmise as to the economic value of this parasite. It has been reared from Diacrisia virginica Fabr. Feltia gladiaria Morrison, and Glaea inulta Grote. Dr Howard has recorded this species as possibly a parasite infesting Notolophus leucostigma Abb. & Sm. to a limited extent. This brief record suggests that this species may be parasitic on some of the arctians and noctuids, and while the former are not of much economic importance, such is not true of many of the latter, and in the control of these, this species may play an important part.

Description. Fulvo-ferruginous, stigma well developed, medium size to rather large; length of body about 19 mm; wing spread about 30 mm.

Head medium, antennae as long or longer than the body; eyes and ocelli black; lateral ocelli a little distant from the eyes; dorsal and dorsocaudal aspect of head yellowish; mandibles bidentate and tipped with black. Mesothorax convex; scutellum and postscutellum prominent; metathorax with inconstant raised lines. Wings hyaline with a glabrous elliptic spot near the stigma in the cubitodiscoidal cell; cubitodiscoidal nervure appendiculate [pl.2, fig.3], legs honey yellow. Abdomen rather strongly compressed, frequently a little darker at the extremity; male claspers subtriangular, obliquely truncate, and acute posteriorly.

Described from numerous specimens.

There are some very small representatives of this species from the Adirondack mountains that approach closely in size and general appearance the following form. They may be separated, however, by the relatively shorter, more compressed abdomen and by the thorax being as dark as other portions of the body.

Distribution. This insect has a wide distribution over the United States and the southern portion of Canada, though it has

not been reported from every state in the Union. Its recorded distribution is as follows: New England, New York, New Jersey, Virginia, Maryland, District of Columbia, Florida, Louisiana, Michigan, Iowa, Missouri, Colorado, Texas, Montana, Nevada, Lake Winnipeg and Sudbury, Ontario.

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1890 **Smith, J. B.** Cat. Ins. N. J. p.25 (Not common at Caldwell)
1891 **Harrington, W. H.** Ent. Soc. Ont. 21st Rep't, p.67 (Parasite of white miller moths)
1892 **Osborn, Herbert.** Part. Cat. Animals Ia. p.15 (Common)
1896 **Evans, J. D.** Can. Ent. 28:10 (Listed)
1897 **Howard, L. O.** U. S. Dep't Agric. Div. Ent. Bul. 5, Tech. Ser. p.30 (Possibly a parasite of Orgyia leucostigma)

Ophion tityri Pack.

This species resembles O. bilineatum Say closely in its general appearance, and it may be an earlier occurring dimor-

phic form but we have no evidence of this and for the present it must be regarded as a distinct species. It may be separated from the preceding by its smaller size, relatively shorter and flatter abdomen, and by the difference in the form of the male genitalia.

Life history and habits. Comparatively little is known of the life history and habits of this insect, since it has been so frequently confused with O. b i l i n e a t u m . There appears to be but one published notice of this parasite since its description in 1882, and in that it is not recognized as a distinct form. This species can hardly be regarded as rare, since over 100 individuals were taken in the trap lantern experiments at Cornell University and it has been frequently collected by the writer and also met with in other collections.

Trap lantern records

	1889																		
	May																		
	5	7	8	9	10	11	14	15	16	17	18	19	20	21	22	24	25	26	28
Male	....	....	1	....	....	1	2	1	2	2	4	10	2	1	2	1	3	2	1
Female	1	1	1	3	1	1	3	1	9	4	1	7	3	4	1	3	3	3	....

	1889																			
	June													July					Aug.		
	2	3	4	5	6	8	11	13	16	17	19	27	29	1	2	3	23	31	1	2	17
Male	....	1	...	...	...	2	...	...	...	...	...	...	...	.....	.....	...	1	...	....	....	....
Female	2	2	1	1	2	1	1	1	2	2	1	1	2	1	1	1	3	1	2	1	1

	1889			1892																		
		Sep.	Total	May	June								July							Aug.		Total
	27	30		26	1	2	4	5	9	19	21	28	1	6	16	17	25	26	28	2	6	
Male	...	.....	39	.....	1	1	1	1	1	...	...	...	...	...	2	...	...	...	...	...	...	7
Female	1	1	79	1	...	1	1	...	...	3	1	1	1	1	...	1	1	1	1	1	1	16

A glance at the above table will show that this insect has a well defined period of flight, and one that does not overlap the time O. bilineatum is abroad, except in the case of scattering individuals. This species appears early in May, is most abundant the latter part of the month, and occurs somewhat rarely during June with belated individuals in July, August and September, while O. bilineatum does not occur till August and then only in scattering numbers till the latter part of the month. This marked difference in the time of flight between these two parasites indicates that either they are two broods of the same insect or else that they are distinct species. The structural difference to be described later must be regarded as proofs of their distinctness. The large eyes and many individuals taken in the trap lantern indicate a crepuscular or nocturnal habit.

Hosts. This parasite has been reared from Epargyreus tityrus Fabr. Prof. G. C. Davis, when at the Michigan Agricultural College Experiment Station, wrote us that he had bred the insect repeatedly from Halisidota caryae Harris and Symmerista albifrons Abb. & Sm. It is probably parasitic on a number of other related insects.

Description. Ferruginous or fulvo-ferruginous with frequently a decidedly fulvous tinge on the thorax, which latter is shorter and the abdomen considerably shorter than in O. bilineatus.

Face ferruginous, or laterally fulvous; head medium; mandibles bidentate, tipped with dark brown, clypeal fossae deep, antennae usually longer than the body; the fossae at their bases not deep; eyes large, reaching nearly to the base of the mandibles. Ocelli black, nearly contiguous and the posterior close to the eyes. Thorax short, ferruginous or fulvo-ferruginous; mesothorax convex; scutellum and postscutellum prominent; metathorax usually with very prominent carinae inclosing deep, four sided areas, and the pedicel of the abdomen surrounded by a high carina. Wings hyaline; cubitodiscoidal nervure strongly appendiculate. First recurrent nervure only about one third the length of the second; bulla of the latter close to the cubitodiscoidal nervure, and that of the latter nearer the second discoidal nervure than the appendix. Legs long, fulvo-ferruginous; abdomen much shorter than in O. bilineatus, very strongly compressed and the posterior segments usually darker in color. Clasps of male subtriangular, obtusely rounded, length 14 mm, wing spread 26 to 30 mm. Described from numerous specimens of both sexes.

Distribution. This species is widely and probably generally distributed in the northern United States and southern Canada. It was described from Massachusetts, has been met with in numbers at both Albany and Ithaca N. Y. and was repeatedly reared by Professor Davis in Michigan. In addition we have specimens before us from New York city [Joutel]; Ottawa, May 19, 24 and June 8, Toronto, August 24, Grimsby, June 6, Port Hope, May 5, and Vancouver Island, May 3, all from Canada through the kindness of Mr W. H. Harrington.

Bibliography

1882 **Packard, A. S.** Bost. Soc. Nat. Hist. Proc. 21:19 (Original description)

1889 **Scudder, S. H.** Butterflies N. Eng. 3:1872, 1880, pl.88, fig.8 (As O. bilineatum; parasite of Epargyreus tityrus)

Ophion bifoveolatum Brullé

This species is one of the more common forms belonging to the genus and if one may judge from trap lantern records, it is largely diurnal and not crepuscular or nocturnal as in the case of some of its close allies. This conclusion is further borne out by the reduced size of the eyes, being decidedly smaller than in related species and distant from the mandibles. This species occurred in the trap lantern material taken at Ithaca in very small numbers compared to those of the closely allied Ophion bilineatum Say. It has a somewhat exceptional host in white grubs, compared with other members of the genus and so far as known to us has not been reared from any other species.

Description. Fulvo-ferruginous with small eyes distant from mouth; costal vein inclined to black; cubitodiscoidal nervure rarely appendiculate; bulla of the second recurrent nervure usually close to tip of cubitodiscoidal nervure and abdomen less compressed than in its close allies.

Head medium; face frequently fulvous laterally, broad; mandibles stout with black tips; clypeal fossae deep and usually black; antennae dark brown, stout and not as long as the body; ocelli black and equidistant. Thorax sometimes dark brown, finely punctured and with sutures more or less black; mesothorax convex; scutellum and postscutellum prominent, the former sometimes a light ferruginous; dorsum of metathorax is usually smooth. Wings hyaline; stigma well developed; costal

and adjacent veins inclined to black; cubitodiscoidal vein usually smoothly arched and rarely appendiculate; bulla of second recurrent nervure usually close to tip of cubitodiscoidal nervure [pl. 2, fig. 2]. Legs uniformly ferruginous; claws pectinate. Abdomen sometimes slightly darker at tip and not strongly compressed but relatively thicker and shorter. Male clasps stout, rather long, obliquely rounded and rather acute at tip.

Length about 15 mm. Wing spread about 28 mm.

This species occurs abroad during the latter part of May and very early in June. Specimens are at hand from Ottawa, Canada taken May 30 and June 6 [Harrington]; Fort Lee N.J. taken May 29 [Joutel]; Malden Mass. taken May 4 [Fernald]; Belfrage Tex., Washington D.C., taken in May [United States National Museum] besides various New York localities. This species has been recorded from the following localities: Mt Washington N. H., New Jersey, New York, Illinois, Iowa, Colorado and Texas. The record of captures in trap lanterns at Ithaca in 1889 and 1892 is given below:

Trap lantern records

	1889								1892									
	MAY		JUNE					Total	MAY	JUNE								Total
	24	26	3	4	8	21	26		30	1	2	3	8	11	16	25	28	
Male											1			1	1			3
Female	1	1	1	1	1	1	1	7	3	2	1	2	1	1	1	1	1	13

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1846 **Brulle, Auguste.** Hist. Nat. Ins. Hymenopt. p.138 (Description)

1862 **Cresson, E. T.** Ent. Soc. Phila. Proc. p.206 (Listed)

1865 —— —— 4:284 (From Colorado)

1873 —— —— Trans. 4:169 (From Texas)

1863 **Norton, Edward.** Ent. Soc. Phila. Proc. 1:358 (Specific characters)

1874 **Provancher, *L'Abbé* A.** Nat. Can. 6:103 (Table of species)

1879 —— —— 11:117 (Table of species), p.118 (Description)

1890 **Ashmead, W. H.** Col. Biol. Ass'n Bul. 1, p.43 (Listed)

1890 **Smith, J. B.** Cat. Ins. N. J. p.25 (Listed)

1892 **Osborn, Herbert.** Part. Cat. Animals Ia. p.15 (Listed)

1892 **Riley, C. V.** Ent. Soc. Wash. Proc. 2:134 (Parasite of Lachnosterna fusca)

1891-92 **Forbes, S. A.** Ins. Ill. 18th Rep't 1894, p.125 (Parasite of white grub)

1896 —— Ill. Agric. Exp. Sta. Bul. 44, p.272 (Same as preceding)

1894 **Slosson, A. T.** Ent. News, 5:4 (In alpine regions of Mt Washington)

Ophion nigrovarium Prov.

This species is undoubtedly closely related to the preceding form, though we have been unable to examine the original type. A few specimens from Colorado which we provisionally assigned to O. bifoveolatum, are exceptionally highly colored, and they probably belong to this species; in which event we are inclined to believe that it is but a variety of the preceding. A translation of the original description is as follows:

♂ Length .6 inch (pouce). Yellowish red varied with black. Head yellow; base and tip of the mandibles, two punctures on the top of the clypeus, the fossa at the insertion of the antennae, with the eyes are of a more or less deep brown. Eyes short, with almost no slope above. Posterior ocelli distant from each other, but close to the eyes. Antennae stout and short, brown. A puncture before the tegulae; the scutellum pale yellow. Thorax yellow; superior border of the prothorax, base of the scutellum, base of the metathorax, its sutures, upper sides of mesothorax, base of the four posterior coxae, black. Metathorax without distinct carinae. Wings slightly smoky; costal nervures brown, stigma yellow. Feet yellow, the anterior coxae in front and the posterior coxae behind more or less spotted with brown. First and second segments of abdomen brown; the posterior segment also brown on the inferior border.

♀ Of a clearer yellow than the ♂. Coxae entirely yellow, except in their articulation with the body. Base and extremity of abdomen of a deep shade of brown. Otherwise like the male. Described from two specimens. Inhabits Canada. [*Nat. Can.* 6:104]

Ophion abnormum n.sp.

A single specimen of this form was received from Colorado through the kindness of Prof. C. P. Gillette, who labeled it no. 2103. This species is very closely allied to what we have considered a light form of O. bifoveolatum Brullé.

Description. Fulvous, with indistinct ferruginous markings on the thorax and abdomen, except that the dorsum of the thorax has two distinct submedian fulvous lines and its lateral margins are also bordered by stripes of the same color. Wing spread 18 mm, length of body about 15 mm.

Head medium, face short, mandibles bidentate, tipped with dark brown or black; clypeal fossae deep, dark brown; antennae slightly shorter than the body; eyes black, small, somewhat dis-

tant from the mandibles. Ocelli glassy or black, well separated and the posterior ones distant from the eyes; thorax glassy; mesothorax convex; scutellum and postscutellum conspicuous; metathorax evenly rounded with no carinae. Wings hyaline; nervures and stigma brown, the latter with fulvous markings; cubitodiscoidal nervure plainly appendiculate, the appendix extending into the second discoidal cell; bulla of second recurrent nervure close to the cubitodiscoidal nervure, and that of the latter nearly equally distant between the appendix and the second recurrent nervure [pl. 2, fig. 5]. Legs ferruginous; claws pectinate; abdomen stout, not strongly compressed.

Described from one female from Colorado.

Ophion ferruginipennis n. sp.

One example of this unique form was in the collection of the United States National Museum and through the kind forbearance of Dr Ashmead its characterization has fallen on the writer. Another specimen was taken by Mr L. H. Joutel in the vicinity of New York city.

Description. Ferruginous; wings ferruginous and with a spread of about 40 mm; metathorax strongly areolated in much the same way as in O. tityri Pack.

Head medium; mandibles bidentate; black apically; clypeal fossae deep; antennae nearly as long as the body. The fossae at their bases are well marked. Eyes large, extending nearly to the mandibles; ocelli black and the posterior pair almost contiguous to the eyes; thorax sericeous; mesothorax convex; scutellum and postscutellum prominent. Metathorax with two well developed transverse carinae and a number of longitudinal ones radiating from the insertion of the first abdominal segment. Wings subhyaline with a distinct ferruginous and, in places, fuscous tinge, specially at their base and along the anterior margins. Cubitodiscoidal vein with its appended vein stub extending one third across the cell from the well marked angle; bulla of second recurrent nervure a little distance from the cubitodiscoidal vein [pl.2, fig.1]. Legs light ferruginous, concolorous; claws pectinate; abdomen strongly compressed and somewhat darker at the tip. Length about 25mm, wing spread about 40 mm.

Described from two females. One is in the collection of the United States National Museum and the other in the New York State Museum.

Ophion costale Cresson[1]

This rare species is represented by only one individual, the type being in Mr Cresson's collection. It may be that this form is but a sport, though at present we can do no better than to allow it to stand as a distinct species.

Description. Female. "Fulvo-ferruginous, shining, face broad, the middle closely punctured, subtuberculate immediately beneath base of antennae; clypeus strongly punctured, tips truncate, lateral sutures and tips of mandibles black; cheeks swollen; antennae shorter than usual, reaching about to tip of second abdominal segment; mesothorax convex, polished; scutellum very convex; metathorax confluently punctured, without transverse carina, sutures of thorax narrowly black; wings subhyaline, stained with yellowish at base and with fuscous along apical costal margin, darkest at tip of marginal cell; basal margin of third and fourth abdominal and an oblique mark on sides of second segment, black." Length 13 mm. Habitat: Klamath county, Cal.

"Readily distinguished from all other species known to me by the ornamentation of the wings." [Cresson]

Genophion n. gen.

This genus is proposed to include certain forms remarkable for the development of the lower portions of the head, resulting in a very elongate face and considerable distance between the normal sized eye and the base of the mandible. This is specially marked in Genophion gilletti Felt, the generic type.

Table of species

a Wings fulvo-fuliginous ..... gilletti Felt
aa Wings with a distinct fulvous tinge..... coloradensis Felt

Genophion gilletti n. sp.

This small form resembles O. coloradensis Felt, but may be easily separated from it by its shorter antennae, longer face and the dark fuscous coloration of the wings. It is described from one female from Colorado, no. 2565, kindly sent me by Prof. C. P. Gillette, in whose honor it is named.

Description. Dark ferruginous, with the head and thoracic sutures black and the wings tinged with dark fuscous. Wing spread about 18 mm, length of body 9 mm.

[1]1878 Cresson, E. T. Acad. Nat. Sci. Phila. Proc. p.366.

Head large, face very long with a large, evenly rounded labrum; mandibles stout, bidentate, tipped with dark brown or black, and with black at the extreme base; clypeal fossae black and almost connected with the base of the mandibles by black impressed lines; antennae shorter than the body, stout and with the first joint of the flagellum much longer and more slender than the second; antennal fossae ringed with black and with a conspicuous, impressed, black area above; eyes rather small, distant from the base of the mandibles; ocelli glassy or black, the two lateral distant from the eyes and each connected therewith by a deep, impressed, black line. Thorax glassy with deeply impressed, jet-black sutures; mesothorax highly convex; scutellum and post-scutellum prominent; metathorax smoothly rounded and with no well developed carinae. Wings distinctly fulvo-ferruginous; cubitodiscoidal nervure uniformly arching, not appendiculate; first recurrent nervure less than one fourth the length of the second; bulla of the second recurrent nervure close to the cubito-discoidal nervure, and that of the latter distant from the second discoidal nervure by one half its length. Legs uniformly ferruginous, except the trochanter segments which are black at their base; claws pectinate; abdomen strongly compressed, first segment slender and gradually enlarging at its apical fourth.

Genophion coloradensis n. sp.

This is a small form having somewhat the general appearance of O. tityri Pack., but differing from it in a number of particulars. It is described from two female specimens in the collection of the United States National Museum.

Description. Ferruginous with the thoracic sutures black, wings tinged with fulvous, wing spread 20 mm, length 9 mm.

Head medium; face long; mandibles bidentate, tipped with dark brown or black; clypeal fossae deep, dark brown; antennae about as long as the body, the fossae at their bases well marked and ringed with dark brown. Eyes medium, distant from the mandibles. Ocelli glassy or black, nearly contiguous, distant from the eyes; thorax sericeous, with black sutures; mesothorax convex; scutellum and postscutellum prominent. Metathorax with three well developed carinae, one dorsal, two lateral, radiating from the insertion of the first abdominal segment. Wings subhyaline, with a distinct fulvous tinge, specially on the hind wings. Cubitodiscoidal vein variably appendiculate (in one only a notch and in the other well marked); first recurrent nervure less than one half the length of the second; bulla of second recurrent nervure near cubitodiscoidal nervure, that of the latter at

proximal third of distance from the appendix to the second recurrent nervure. Legs light ferruginous, basal articulations variably marked with dark brown, claws pectinate. Abdomen strongly compressed, first segment slender, gradually enlarging at apical third.

Described from two females from Colorado.

INJURIOUS INSECTS

Chrysanthemum lace bug

Corythuca marmorata Uhler

Ord. Hemiptera *Family* Tingitidae

Members of this family have been characterized by Professor Comstock, in the following terms: "Dainty as fairy brides are these tiny, lace-draped insects. One glance at the fine, white meshes that cover the wings and spined thorax is sufficient to distinguish them from all other insects, for these are the only ones that are clothed from head to foot in a fine white Brussels net." This very fitting description applies to all members of the family, and where such insects are found on chrysanthemums, they are very likely to be this species. This group is not only unusual in appearance, but is also one rarely brought to the attention of the economic entomologist. This is particularly true of the species under consideration, concerning which comparatively little is known. It was described in 1878 from North Carolina but with no indication of its food habits. The next record appears in 1898 and relates to an attack the preceding year on chrysanthemums in Alabama.

This insect was brought to our notice last July by Mr Harry Blauvelt of Coeyman, who stated that it had caused considerable injury the past two or three years, and that he feared a repetition of the attack this season. His brother, Mr Egbert Blauvelt, observed that it bred abundantly on ragweed and also on some other which he was unable to identify. Specimens of the insect were colonized on potted plants and the accuracy of the complaint established beyond question. The little pests fed vigorously on the foliage, laid numerous eggs, many young developed and soon

one plant after another assumed an unhealthy appearance and died. The attack was characterized in particular by a discoloration of the leaves accompanied by a dark spotting, due to excrement, and the cast skins of the young were also abundant. The general appearance of a badly infested leaf is shown on plate 3.

Life history. The breeding of this insect was placed in Mr C. M. Walker's charge, but owing to pressure of other work he was unable to give it all the attention desirable. He learned, however, that the eggs were laid on the underside of the leaf, being thrust under the epidermis along the larger leaves and veins, leaving only the small, yellowish, conical cap in sight. The eggs soon hatch and the young develop rapidly, since between June 11 and 23 a life cycle was nearly completed. The feeding of the insect causes white, irregular blotches to appear, and if the attack is at all severe, withering of the leaves. The various molts follow each other quickly and the cast skins soon become so abundant as to give the impression of a bad infestation, whereas only a few bugs may be present. The insects are very active and pass readily from one plant to another, though none of the adults were observed to fly.

Description. This species has been the object of considerable study, and the following descriptions and the original illustrations were made under our direction by Mr C. M. Walker. It is believed that all stages are described below though they were not obtained by close breeding.

Egg [pl.4, fig.1]. Length about .5 mm, width .25 mm. Ovate, somewhat fusiform; visible tip truncate, collared, within which is a small, yellowish, ridged conical cap which is displaced by the young when it emerges.

Stage 1. Length .5 mm, breadth one third of length; antennae stout, with numerous long spines; three segmented, the terminal segment being about twice the combined length of the first and second. Legs stout, and about as long as the insect. There are simple spines arising directly from the body [pl.4, fig.2*b*], and also much shorter, compound ones originating from cone-shaped bases [pl.4, fig.2*a*]. Each abdominal segment bears on its lateral margin a single somewhat trumpet-shaped, compound spine on a conical base [pl.4, fig.3]. Two oval openings occur on the dorsal line of the posterior margin of the third and fourth abdominal segments. These may possibly be analogous to the odoriferous glands which occur in certain other species of Heteroptera.

Stage 2 [pl.4, fig.4]. Length 1 mm, width .4 mm. Form broader in proportion to length than in the first stage, and the legs are much shorter. The chief difference between this and the preceding stage, is in the size and number of spines. The dorsal, compound spines, which in stage 1 arose from conical bases, have become much thickened, taper to a point and are about one fourth the length of their bases, which latter are enormously developed and thickly studded with chitinous projections [pl.4, fig.5*a*]. The long simple spines arising directly from the body, are shorter and their bases narrow [pl.4, fig.5*b*]. The marginal, compound spines of each abdominal segment have lost all resemblance to their previous form. Their rugose, spined bases have become thickened and are about twice the length of the spine, which latter is narrowed to a sharp point.

Stage 3. Length 1 mm, width .5 mm. The terminal segment of the antenna is about two and one half times the combined length of segments 1 and 2. In this stage the compound dorsal spines mentioned in the preceding have apparently suffered little change, but their bases have increased five times the length of the spines, and are correspondingly stouter and rougher [pl.4, fig.7*a*]. The simple spines situated near these latter have not changed much, though they are somewhat longer than in stage 2 [pl.4, fig.7*b*]. The bases of the lateral abdominal, compound spines are four times the length of the spines [pl.4, fig.8*a*], which latter have not changed in appearance. Contiguous to these, singly or in pairs, are other shorter compound spines on conical projections about twice their own length [pl.4, fig.8*b*].

Stage 4 [pl.4, fig.9]. Length 1.5 mm, width .75 mm. Form ovate, tapering anteriorly. Head nearly as wide as long, obtusely rounded with the lateral margins behind the eyes arcuate, hind angles rounded. Antennae four segmented, segment 3 a little longer than the fourth, which is about equal to the combined length of 1 and 2, the last being about one half the length of the first. Rostrum stout, dark at tip and extending to about the base of the first abdominal segment. Head, bearing four groups of compound spines on tubercles or bases of varying size and length arranged as follows: a median pair at the anterior margin; three directly back of these, the central one being smaller; two groups of five of various lengths, each a little behind the eye and halfway between the median line and the lateral margin. A long simple spine is also found at the base of each of these groups.

Prothorax tapering anteriorly, three times as broad as long; with two median pairs of grouped compound spines at about equal distance from the anterior and posterior margins, the anterior pair with two smaller spines at their bases. Laterally there is a group of three compound spines at the apical angle

of the prothorax, the central one largest, and another of five at the posterior angle, three being much larger than the others. The wing pads are seen for the first time and extend to the anterior margin of the second abdominal segment. There are two sublateral groups, each consisting of two compound spines, one larger, one smaller and a simple one, near the posterior margin of the mesothorax. The anterior lateral margin is armed with a stout spine similar to that on the preceding segment, and on the posterior angle there is a group of five compound spines similar to those on the prothorax.

The abdomen consists of 10 segments, numbers 2 and 3 having a single lateral spine, while segments 4 to 8 are each ornamented with lateral groups of three compound spines [pl.4, fig.10], one being nearly twice the length of the other two. Segment 9 bears only one on each side. There is also a slender, hairlike spine of considerable length at the base of each group of spines on segments 2 to 8. Segments 2, 5, 6, 8 and 9 each bear a median pair of long, stout, compound spines [pl.4, fig.11*a*], each of which, with the exception of those on segments 2 and 9, has a simple spine at its base [pl.4, fig.11*b*]. The so called odoriferous glands appear as in the younger stages on the dorsum of the third and fourth segments. Certain extremely minute projections, with enlarged extremities are scattered over the body, arising directly from its surface. There are also more numerous chitinous points generally distributed and which give the body a brownish appearance.

Stage 5. Length about 2 mm, width nearly 1 mm. The first two segments of the antennae are about equal in length. The third is longest and not quite twice the length of the fourth [pl.4, fig.13]. The wing pads extend to the fifth segment of the abdomen, which latter is nearly fusiform, tapering anteriorly from the extremity of the wing cases. The dorsal spines are relatively much larger and more specialized and the lateral groups on the thorax and abdomen, excepting the last segment of the latter, are distinctly pediceled [pl.4, fig.12]. This is also true of the anterior median pair of the prothorax, which almost coalesce, and of the median pair of the mesothorax.

The original description of the adult is as follows: "Form smilar to that of T. a r c u a t a Say. Body black, the humeral region and pleural margins sometimes paler, or piceous; the venter polished, minutely, transversely wrinkled. Bucculae highly elevated, white; antennae slender, the apical joint sometimes dusky. Pronotal vesicle high, extending far forward, regularly arching over the head, abruptly compressed anteriorly for more than half its length; the meshes large, two larger ones occupying the basal breadth; the nervures more or less embrowned, that of the middle carinate, much elevated, entire.

Most of the nervures with short spines, which in some specimens are obsolete. Lateral lobes of pronotum short, prominent, semicircular, having the same curve anteriorly as posteriorly; narrower than the base of the hemelytra, with large, rather regular cells; the nervures of the middle tinged with brown; a brown spot exteriorly and sometimes a second spot at the posterior margin; the marginal spines long and slender. Processus divided into cells as far as the tip; only the base of the lateral margin elevated, the middle carina high, not so high as the pronotal vesicle, gradually declining to the tip, the base arched, bearing two large areoles surmounted by a series of smaller ones, the upper edge spinous. Raised margin of the sternum whitish, the metasternum circular, auriculate each side. Legs pale honey yellow, embrowned at tip and on the tarsi. Hemelytra rather quadrangular, with the basal angles very acute, very widely removed from the pronotal lateral lobes, the basal margin distinctly concave; lateral margins spinous until a little beyond the middle, the tips widened, bluntly, broadly rounded; areoles large, next to the apical series is a transverse row of three or four very large ones, usually connected with another large one in front exteriorly; vesicular elevations small, with a high carina, spinous, bearing posteriorly a brown spot; a brown spot exteriorly near the basal angle, another submarginal near the middle, and a broad brown band at tip which omits the subapical series of large areoles.

Length, 3 mm. Breadth at base of hemelytra, 1½ mm."

Remedies. This little pest being a sucking insect, can be controlled only in two ways. Clean culture will probably prove the most effective method of checking its depredations, since it would mean the destruction of weeds and various plants on which the insect could breed. There is little probability of the pest developing in large numbers if the vicinity of a chrysanthemum field is kept clear of weeds. The pest may be severely checked, if not nearly destroyed by thorough spraying with a whale oil soap solution, using 1 pound to 9 gallons of water, according to Mr Egbert Blauvelt. It is very probable that pyrethrum powder, or better still, hellebore could be used wherever a limited number of plants require treatment.

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1898 **Howard, L. O.** U. S. Dep't Agric. Div. Ent. Bul. 10, n. s. p.99 (Injuries in Alabama)

NOTES FOR THE YEAR

The season of 1903 has been marked in particular by an unusually severe outbreak of plant lice of various species, some of which continued their depredations over an abnormally extended period. These insects were so destructive and generally present on various plants in different sections, that observations relating thereto have been grouped under a separate head. Species depredating on other plants and products of value, have been grouped under convenient headings for the purpose of facilitating ready reference to the various accounts.

Plant lice

The season of 1903 may well be remembered on account of the exceeding abundance of these little insects, particularly of species of economic importance. This is an exceedingly interesting group, and their almost absolute helplessness and enormous prolificacy illustrate one of nature's provisions against the extermination of a species. Despite their apparent weakness, these little creatures are well able to hold their own, as many farmers know to their cost. This group is at present represented in America by the relatively large number of 325 species, as given by Professor Hunter in a recently issued list.

The conditions which control the abundance of these forms are not well understood, though in all probability they are largely climatic, supplemented by the beneficial work of various natural enemies. Some believe that dry weather is favorable to the increase of these little insects, and others attribute their abnormal development to a certain amount of moisture. It is very probable that a protracted dry spell, if not accompanied by excessive dust, is favorable to the development of a large number of species, and that violent rains at intervals, specially if they occur before the foliage is curled by the work of the pests, is very destructive to these little creatures. On the other hand, it is quite possible that a certain amount of moisture is desirable, and that the reports of certain persons, who have noted a coincidence between the appearance of rains and the development of these forms, may be correct.

It is undoubtedly true that natural enemies, prominent among which are ladybugs, syrphus flies and lacewing flies, serve as very useful checks on this interesting group of insects. Repeated observations in different countries, and extending over a series of years, have demonstrated that these insects multiply enormously during periods when plant lice are unusually abundant, and though it may require some time for the natural enemies to overtake their hosts, this is bound to occur in course of time.

The attack of 1903 was not only characterized by excessive severity but also by an undue prolongation; and this latter may have been in part due to unusual rains, which were not favorable to the comparatively unsheltered natural enemies and hindered their gaining an ascendancy over their hosts. The explanation for this is that the plant lice, before the appearance of the rains, had ample opportunity to curl the leaves and therefore provide themselves with shelter from almost any inclement weather. These retreats afforded admirable breeding places from which the insects could emerge and attack adjacent foliage, so that the usual destructive influence of showers would be modified to a considerable extent; on the other hand, the larger predaceous enemies would hardly reap an equal benefit from this protection, and consequently would be delayed in gaining the ascendancy.

Appletree plant lice (A p h i s m a l i Linn. and others). These species commonly occur in greater or less numbers throughout the orchards of the State, and their abnormal increase depends on favorable climatic or other conditions. Such was characteristic of the spring and early summer of 1903, and as a result injuries by these species were not only much more marked than usual but also prolonged to a much later date. The worst affected trees, which were usually young, presented a very characteristic appearance, and the injury was so severe that very little growth was possible. Such a large amount of honeydew was excreted that the foliage was almost entirely blackened, and an examination of many trees showed that the growing tips were literally covered by hungry plant lice anxious to reach a tender spot. The severity of the attack began to be evident about the last of May, and was more so in June, continuing in July, and in

some cases at least the plant lice were extremely abundant even to the middle of August. The worse infested trees lost a considerable portion of their foliage; the development of the fruit was severely checked in some instances and many trees were seriously injured. Complaints were received from a number of correspondents in different sections of the State, and almost every observer agreed in holding plant lice responsible for severe damage. Some quince bushes in Genesee county were reported by Mr J. F. Rose as bearing a mass of black, rolled leaves the latter part of June, and the observer in Dutchess county characterized the attack as being more severe than had been known for 10 years. The conditions in the nursery were no better than in the orchard, and a correspondent reports that plant lice obliged him to keep a gang of 15 or 20 men and boys at work continuously in the nursery with a whale oil soap solution, and some other nurserymen found themselves almost unable to cope with the insects, so severe and general was the injury.

Plant lice, as is well known, must be controlled by the use of contact insecticides, the most valuable of which for present purposes are a whale oil soap solution, tobacco water and kerosene emulsion. Some growers prefer the tobacco solution to any other and attribute greater effectiveness to it, while others have obtained excellent results with a whale oil soap solution. The latter, in the case of the appletree plant louse, should be used at a strength of 1 pound to 6 gallons of water, or even 1 to 4, and in any case great care should be exercised to secure thorough treatment. The kerosene emulsion may be used in the same way as the whale oil soap solution, and in case of severe attacks the standard emulsion may be diluted with but 6 or 7 parts of water, since it is better to scorch the foliage a little than to allow many of the insects to escape.

The severe and protracted injuries by plant lice led us to experiment with whale oil soap solution, 1 pound to 4 gallons, for the purpose of testing its effectiveness on the pest and also the liability of injuring the foliage. Apple twigs covered with the insects were dipped into the solution July 28, and on the 30th it

was found that all were killed, while repeated observations up to Sep. 8 failed to reveal any injury to the leaves. We are, however, inclined to believe that it is more important to make a very thorough application than to use a strong insecticide, and would therefore emphasize the former most strongly.

Cherry plant louse (Myzus cerasi Fabr.). This common species is likewise generally distributed throughout the State, and always occurs in greater or less numbers on cherrytrees. The past season has been marked by an excessive abundance of this insect, and in some cases sweet cherrytrees have been very seriously injured. We recall, for example, certain trees in Chautauqua county, which were so badly infested, that nearly one third of the leaf-bearing portion of twigs had the foliage so badly affected that it curled, died and dropped, and after a time new leaves were developed in their place. This injury was so great that one or two trees died, probably as an indirect result of the severe drain made on their vitality. The presence of these plant lice in large numbers began to be apparent the middle of May and continued through June and even into early July. Reports of injuries were received from a number of counties in widely separated sections of the State, and were also observed by us in various localities.

Thorough spraying, as in the case of other species, is the only method of controlling this insect, and when applications are necessary they should be timely so that the insects can not curl leaves and thus obtain shelter from the spray.

Cabbage aphis (Aphis brassicae Linn.). This species is usually present in small numbers on various cruciferous plants, and only occasionally does it attract much attention on account of its abnormal abundance and consequent injury. Mr J. F. Rose of South Byron states that about the middle of August it was so abundant on early cabbages as to give them a white appearance, and Mr George S. Graves of Newport, Herkimer co., reports it as being numerous on turnips in early August. This species was observed by us in very large numbers on rape at Kinderhook the early part of the season. The insects were so abundant as to

give a whitish color to portions of the plant and rendered walking through the field extremely disagreeable.

Chaitophorus aceris. The Norway maple has enjoyed up to recent years comparative immunity from insect pests, and it was therefore a serious disappointment to its admirers when this species of plant louse injured it so seriously in the last two or three years. The damage by this species has gradually increased, and whereas in 1900 or thereabouts many of the trees had their foliage somewhat disfigured by the sooty fungus growing in the honeydew and drops of this sticky substance occasionally fell on passersby or moistened the sidewalk beneath, in 1903 some of these unfortunate trees had their foliage almost ruined by this pest. Many of the leaves were so badly curled that they presented only about one fourth of the usual surface, and this maple instead of being an object of beauty, was a monument of misery and an eyesore on the landscape. This was true not only about Albany but in various sections of the State. This plant louse can be controlled by thoroughly spraying with a contact insecticide, such as whale oil soap, taking special pains to hit the insects on the undersurface of the leaves, and it looks as though some such treatment would have to be adopted in coming years if we are to keep this shade tree in good condition. This species was the cause of more complaint and incidentally gave more employment to parties operating a spraying outfit in Troy, than even the notorious elm leaf beetle (Galerucella luteola Müll.).

Elm aphis (Callipterus ulmifolii Mon.). This delicate species occurs somewhat generally on our American elms, and occasionally becomes exceedingly injurious, as was demonstrated in 1897 and again in 1903. This little plant louse was so abundant on many trees during the past summer that the foliage became badly smeared by the honeydew, lost its color and all but failed to perform its proper functions. This condition was somewhat general in the vicinity of Albany, at Palatine Bridge in the Mohawk valley, and a similar state of affairs was reported from Ogdensburg, St Lawrence co. The most of the

damage appears to be inflicted in the latter part of June and during July.

Drepanosiphum acerifolii Thos. This delicate and really beautiful species when examined under a magnifying glass, is capable of causing considerable injury to various species of maple. Its work on hard maple was observed by us last July at Nassau, where it evidently caused considerable dropping of the foliage, and the young were to be found here and there along the veins on the underside of the leaves. Nearly full grown specimens are remarkable for being incrusted with a whitish secretion which nearly covers them. This species was met with by us in considerable numbers on maples at Saratoga, where it has likewise caused some dropping of the leaves and injured the foliage to a considerable extent. It was also reported by Mr George S. Graves, as being on several varieties of maple at Newport, Herkimer co., where it caused much dropping of foliage, and it was observed by Mr Young in small numbers at Poughkeepsie.

Box elder plant louse (Chaitophorus negundinis Thos.). A number of specimens of what we believe to be this species, was submitted for examination by Mr George S. Graves of Newport, Herkimer co., who stated that it was exceedingly abundant and destructive to box elder or ash-leafed maples in that vicinity. The attack was first observed in early June and continued till September, possibly later. It is probably the same species which we observed at work in large numbers the latter part of September on some box eldertrees at Nassau.

Beechtree blight (Pemphigus imbricator Fitch). This plant louse was exceedingly abundant on some beechtrees at Newport N. Y. Our correspondent, Mr George S. Graves, sent examples under date of Oct. 29, and from the appearance of the twigs we judge that the insect was present in enormous numbers, and had the attack been earlier in the season, it would undoubtedly have caused considerable injury. Mr Graves observed the habit of this species of clustering on the underside of the twigs, and adds that moderately cold weather does not seem to affect them, since an inch of snow was seen on the hillside

only a short distance away, and the temperature during the preceding two days had been quite cold.

Wooly beech aphis (Phyllaphis fagi Linn.). This insect has been unusually numerous on purple beech foliage in Washington park, where it was found in very large numbers, July 4. Its depredations on the same tree in Westchester county have also been brought to our attention.

Birch aphis (Callipterus betulaecolens Mon.). This little species is particularly injurious to the cut-leaved birch, and is occasionally very abundant. It was reported as being quite destructive at Newport, Herkimer co., by Mr George S. Graves, and evidences of its work were found by Mr Young at Poughkeepsie in the middle of July. The latter trees showed very plainly that the insect had been exceedingly abundant, since the foliage was badly discolored and well smeared with honeydew. We also observed the work of this insect in the vicinity of Albany, and specimens of very badly infested twigs were submitted for examination by Mr E. P. Van Ness of East Greenbush. In this instance, as in the preceding, the attack was a very severe one and the tree had undoubtedly suffered greatly throughout July, if not earlier in the season. Some of the leaves bore a number of pupae of the two spotted ladybug, Adalia bipunctata Linn., which had evidently fed on the plant lice, and reduced their numbers very largely.

Pemphigus popularius Fitch. This species is rarely brought to notice, though a few infested leaves of the balm of Gilead, Populus balsamiferus, were received from Lake Clear Junction through Mr C. R. Pettis. The leaves were drawn together and had much waxy matter on their surfaces, giving them the appearance of having been coated with a whitish powder. In some instances the insects formed a series of pseudogalls on the upper side of the leaves. The cavity produced by drawing the leaf together contained numerous winged plant lice, a few nymphs and many cast skins. Mr Pettis states that all the trees in the vicinity were affected by this species. Another poplar-infesting species, Chaitophorus populicola Thos., was met with in considerable numbers on the common aspen at Karner, July 24.

Fruit tree insects

Plum curculio (Conotrachelus nenuphar Herbst). This little enemy of stone fruits is prevalent to a greater or less extent in most orchards of this State, and occasionally causes considerable injury. It is remarkable for existing in some localities in such small numbers as to cause practically no damage, while in others a large proportion of the crop would be ruined unless collecting or other repressive measures were employed. Recent experiences by several growers in the State, go far toward showing that thorough and early spraying of the foliage with an arsenical poison affords considerable protection from this pest. This method is preferred by many to the more laborious one of collecting the beetles and is certainly worthy of further trial.

Diplotaxis liberta Germ. This species is rarely brought to notice on account of its depredations and the same is true of its allies. A complaint was received Sep. 24 through the commissioner of agriculture from Mr John R. Crandall of Hauppauge, who stated that this beetle had stripped all the foliage from many young peachtrees in an orchard of about 30 acres. He added that they worked at night, burying themselves in the dirt under the trees during the day, and that anywhere from 10 to 50 were found under each tree, apparently preferring Elbertas. The beetles occurred nowhere except in the peach orchard. This insect is closely related to our common May or June beetles and presumably has similar habits, the larvae probably living on grass roots and undoubtedly thriving best in light, sandy soils. Reference to literature shows that another species, D. frondicola Blanch., was recorded in 1871[1] as being very injurious in June to leaves of rose, mountain ash and wild plum in an Iowa nursery. They were about nearly a month, feeding only at night, and were considered one of the worst pests of that year. An attack similar to the one we have recorded occurred in the spring of 1888,[2] at Herndon Va. in a young orchard which had been mostly planted the preceding year. The 12-spotted Diabrotica, Diabrotica 12-punctata, was the principal depredator, though a species

[1]Kridelbaugh. Ia. State Hort. Soc. Rep't 1871. 1872. p.161.
[2]Riley-Howard. Insect Life, 1:59.

of Diplotaxis was also present in small numbers. The plums and apricots near an old melon patch where the Diabrotica had bred were soon stripped of foliage and the insects spread over nearly the entire orchard. Another species of the same genus, D. harperi Blanch., was reported May 24, 1894,[1] as injuring strawberry plants at Campbellsburg Ind. The account states that they attacked the smaller and weaker plants on a 2½ acre field and very quickly destroyed them. As many as 20 beetles or over were found at a time on a single plant. The insects appeared first in some wheat and when that became too tough migrated to the recently set strawberry field. The soil was a light, clayey loam and paris green was applied but without benefit.

These little scarabaeids are difficult insects to control and in a general way may be classed in this respect with the closely related and well known May or June beetles, Lachnosterna, and rose beetles, Macrodactylus subspinosus Fabr. Anything that tends to make the foliage distasteful to the insects, such as dusting with air-slacked lime, wood ashes, etc. has some protective value, but comparatively little benefit results from spraying with an arsenical poison. It is possible that collecting the insects by jarring into a curculio catcher might prove of some value. This would have to be done in the evening when the beetles are on the trees, and in all probability it would require considerable shaking to dislodge them. The injury to the foliage late in the fall is of comparatively little importance compared with depredations in the spring, and apparently there is a prospect of this species causing some injury at that time, in which event it would pay to go to considerable expense in collecting the beetles or employing some other means to destroy them, so as to prevent severe injury to the trees by the destruction of fruit and leaf buds early in the season.

Appletree tent caterpillar (Malacosoma americana Fabr.). This insect is more or less injurious each year, and during the present season has not been very destructive, though somewhat abundant in various localities, specially where no effort has been made to control it. The injury, as a rule, has been less than

[1]Davis. Insect Life, 7:199

in the last two or three years, except in Cattaraugus county, where this species is reported as having increased very largely in the last two or three years.

Codling moth (Carpocapsa pomonella Linn.). It is well known that the larvae of this insect pass the winter in considerable numbers under the sheltering bark of trees, and that they gnaw pupal cavities in the outer dead bark. Our attention was recently called to a somewhat anomalous situation and an examination showed that a small tree had been badly injured by borers in preceding years and that codling moth larvae, descending the tree in the fall, had entered the galleries made by the borers and in excavating pupal cavities had not refrained from eating into living tissue where they caused considerable bleeding and at first sight lead one to suspect that the injury was due to the round-headed borer. The tree in question has a trunk about 6 inches in diameter and some 12 or 15 larvae were taken from several of the cavities. Three or four of the caterpillars were found contiguous to living tissue which had been recently eaten and from which considerable sap was flowing. The borings were conspicuous and many of the pellets were saturated with exuding sap.

Pear Psylla (Psylla pyricola Forst.). The season of 1903 has been remarkable for the unusual development of plant lice, and this little jumping species is no exception to the general rule. It has been exceedingly abundant and destructive over a considerable portion of the State, and peartrees with blackened, scanty foliage or almost none at all, were common sights during the summer not only in the Hudson river valley but also in central and western New York. The injury was much more general and severe than has been observed before, and the explanation therefor is probably found in the unusually favorable climatic conditions. Evidences of great damage began to appear in June, and during July and August the affected trees presented a truly wretched sight. In some cases the injury was so severe that most of the fruit dropped. Mr H. D. Lewis of Annandale reports the crop of that section a failure, due to the work of this pest.

Early and thorough spraying with a whale oil soap solution, 1 pound to 4 gallons, has been found thoroughly effective in the hands of Mr Albert Wood of Carleton Station, who states that he has succeeded in keeping the insect well in subjection by this means. Thorough work in the early part of the season will do much toward preventing subsequent injuries, and if the necessity arises of repeating applications, much better results will be obtained if the work is done just after a rain, which serves the useful purpose of washing away the honeydew and therefore exposing the growing insects to the deleterious action of the insecticide.

San José scale (Aspidiotus perniciosus Comst.). This pernicious insect has become so abundant in some orchards in the State that its control is a serious problem, and anything bearing on its habits and disseminative powers is of interest. The latter part of the summer was marked by the development of very large numbers of insects, the breeding being so rapid that in some places the bark of entire trees was covered.

The rapidity of its spread in a locality is of great importance, and is undoubtedly influenced by a number of factors. In the first place, there is no doubt that the spread is much more rapid where the pest is allowed to breed unrestricted than in localities where such is not the case; for example, the scale has been in the large orchard of Mr W. H. Hart of Poughkeepsie for 13 years, and yet it has failed to spread to any great extent, portions being practically free from it even after the lapse of years. A close examination of the center of infestation existing at Clinton Heights shows that while the insect has been present there for about the same time there has been no extensive spread. The primary point of infestation is a little to one side of the center of an isosceles triangle, which has an altitude of $\frac{3}{4}$ mile. This is bordered on one side by a public highway and on the other by a trolly line. Several contiguous orchards lie within this area, and the pest has gradually made its way from one to the other, though the spread has by no means been rapid. Aside from the point of original infestation, the injury to the trees has not been very marked, in fact, the spread through these small orchards

has been so slow that those in the point of the triangle, less than half a mile from the original infestation, are still free from the pest. An examination of orchards just across the highway from near this center, failed to reveal any scale. It should be stated in explanation, that while the insect was allowed to breed in considerable numbers from about 1897 to 1899, since then earnest efforts have been made to keep it in check, and as a general thing, it has been controlled in a fairly satisfactory manner. It is true that there is one point of infestation a half mile southwest of the source of trouble, but investigation shows that in all probability the scale became established there by being carried on infested trees which were set in that vicinity.

Investigations and inquiries in a peach-growing section, where the scale had become established in a few places 3 or 4 years ago, reveals the fact that the pest has already obtained a foothold in some orchards from ½ mile to 2 miles or thereabouts from others, and in this instance we are inclined to believe that these colonies established at a distance are due to the fact that no very adequate control of the insect has been maintained. It may also possibly be explained in part by the fact that young scales are fully as likely to crawl on peach foliage as on that of other fruit trees, and it would therefore stand a better chance of being conveyed by insects or birds.

New York plum scale (Eulecanium juglandis Bouché). This species is well known as a very destructive form to plumtrees in western New York, where it has at times been exceedingly injurious. Our attention was called in August to a plumtree at Kinderhook N. Y., which had the undersides of its branches literally covered with full grown scale insects and a great many young were found beside the parents. The tree itself had suffered serious injury though there were no signs of any numbers of the pest on those adjacent. This insect, as is well known, can be readily controlled by spraying in the fall or early spring with a contact insecticide, such as kerosene emulsion or whale oil soap solution, and we see no reason why the lime-sulfur wash, if it is to be employed in the orchard, would not be as effica-

cious in killing this species as it is in the destruction of the San José scale.

Plum mite (Phytoptus phlaeocoptes Nal.). The presence of this little mite on plumtrees at Marlborough, was brought to our attention some years ago, and an examination the present season shows that it exists in the locality only in very small numbers, and as a consequence is hardly likely to become a pest of any importance. The owner has cut down the original tree and anticipates very little trouble in the future.

Grapevine pests

Grapevine sawfly (Blennocampa pygmaea Harr.). The larvae of this species were met with rather plentifully July 28 in the vineyard of Mr W. H. Van Benschoten, West Park N. Y. Tips of shoots, here and there, were partially defoliated, but in no instance was material injury caused. The larvae are usually rare in New York State vineyards, so far as our observations go, and in case of their appearing in very large numbers, they should be controlled by thorough spraying with an arsenical poison.

Steely flea beetle (Haltica chalybea Ill.). This pernicious Chrysomelid is well known to grape growers, and in some vineyards in the Chautauqua region it has caused considerable injury year after year; particularly is this the case with certain vineyards located well up on the hill and back from the lake. The greatest damage is done by the beetles feeding on the unfolding buds, and the best method of checking the injury is undoubtedly by very thorough spraying or even painting the unfolding foliage with a strong arsenical mixture, particularly paris green or london purple, because these substances act more quickly than does arsenate of lead.

Grapeberry moth (Polychrosis botrana Schiff.). This insect was not only destructive in Chautauqua county but developed in such large numbers in some Ohio vineyards as to destroy one third of the crop as reported by Mr T. S. Clymonts. Our experiments have shown that one thorough spraying with an arsenical poison, preferably arsenate of lead, just after blossom-

ing, will result in severely checking this pest [*see* New York State Museum Bulletin 72].

Garden insects

Asparagus beetle (Crioceris asparagi Linn.). The common asparagus beetle as recorded in our 15th report, page 540, has attained a wide distribution over the State, though our records limit it almost entirely to the lower Hudson and Mohawk river valleys and the western portion of the State in the vicinity of the lakes. We were therefore somewhat surprised to receive a communication from Mr C. L. Williams of Glens Falls, Warren co., accompanied by specimens, stating that this species had become well established in that vicinity and was known to occur in some numbers over an area several miles in extent. This is the northernmost locality known to us, for the species in New York.

Cabbage maggot (Phorbia brassicae Bouché). This little pest of the market gardener was unusually abundant and destructive this season. Its depredations on early cabbages attracted considerable attention in Genesee county, it was credited with having destroyed one fourth of the crop in St Lawrence county, and with working to some extent in Cattaraugus county and other sections of the State. The life history of this little pest may be summarized briefly as follows: the adult insects appear in the early spring, the precise time depending somewhat on climatic and other conditions. They are, however, usually abroad in time to deposit eggs around early set plants, finding some crevice in which they may creep and place their eggs close to the stem. These remain unhatched for a period variously stated as from 4 to 10 days when the young grubs issue, attack the surface of the root and rasp a burrow into its tissues. They destroy first the smaller rootlets and then begin operations on the main root. They are frequently found in slimy burrows just beneath the surface of the stem. There are usually so many maggots that all are unable to find retreats within the tissues, and consequently many of them lie near the surface, which is kept moist by the juices from the injured parts. The wilting of the plant is the most

characteristic indication of injury and on pulling it up, the remains of the roots and the whitish, slimy maggots are easily observed.

One of the best methods for protecting cabbage plants from this insect is to surround them with a tarred paper collar about 2½ inches in diameter, which is so cut as to practically encircle the stem. These are readily adjusted about the plant, easily cut and form one of the most efficient methods of preventing the parent fly from depositing its eggs.

A carbolic soap emulsion composed of 1 pound of hard soap dissolved in a gallon of water, in which 1 pint of crude carbolic acid is then poured, emulsified and diluted with 30 parts of water, is very efficient in killing the maggots about infested plants. An application should be made shortly after the plants are set out, and repeated once a week or 10 days till after the middle of May. The standard kerosene emulsion diluted with 12 to 15 parts of water has also proved very successful. Either may be readily applied with a knapsack pump. It is possible to check the attack, where labor is cheap by removing the earth from the affected parts in the morning of a bright day and replacing it at night. The drying kills the maggots without injury to the plants. This is practised to some extent on Long Island, as stated by Mr F. A. Sirrine.

Onion maggot (Phorbia ceparum Meigen). This serious pest of market gardeners has, like its close ally, the cabbage maggot, been very injurious in portions of the State, particularly in St Lawrence county where it is credited with having destroyed one fourth of the onion crop. It has also caused considerable complaint in the vicinity of Albany.

This insect, so far as known, has a life history very similar to that of the cabbage maggot, and may be controlled in like manner, except that it is impracticable to use the tarred paper collars though the carbolic soap wash can be employed to very good advantage.

Tarnished plant bug (Lygus pratensis Linn.). This notorious and almost ubiquitous pest occurs on a great many

plants and causes more or less injury from year to year. Last July our attention was again called to it on account of its sucking the juices from tender aster shoots and thereby killing them. Mr Egbert Blauvelt of Coeyman, who made the complaint, states that the insects can be killed by thoroughly spraying with a whale oil soap solution, using 1 pound to 9 gallons of water. Clean culture, not only in the garden but in adjacent fields, will do considerable toward reducing the numbers of this pest.

Grain and house pests

Saw-toothed grain beetle (Silvanus surinamensis Linn.). This little grain beetle is a common species in prepared foods and various grains and though occasionally very abundant, it does not as a rule cause much annoyance in this country. This species was found last August literally overrunning a dwelling house in Albany. The beetles were so numerous that they made their way into everything and the housekeeper could sweep up nearly a pint almost every warm day. They were found in all parts of the dwelling, resting on ceilings, crawling on walls, under mats, tablecloths etc. and even invaded wearing apparel, articles of food, etc. Investigation showed that the source of the trouble was several thousand bushels of oats in the bin of a near-by brewery. The insects were breeding there very rapidly and on warm days appeared in large numbers and invaded near-by dwellings. The best remedy for such an outbreak is fumigation of the grain with carbon bisulfid and similar treatment of the dwelling houses or better still fumigating them with hydrocyanic acid gas. This latter, however, is a very dangerous poison and must be handed with extreme care.

Fleas. The cat and dog flea (Ceratopsyllus serraticeps Gerv.) is a well known pest of domestic animals, and in the public mind is associated only with these animals. There are a number of records of this species propagating to a marvelous extent in houses closed for the summer, and the occupants on opening them in the fall would find their premises literally overrun by these annoying, active and most hardy pests. This has

been the experience of several Albanians in the past summer, and the most practical way of ridding the house of these vermin is by thorough fumigation with hydrocyanic acid gas, using 1 fluid ounce of sulfuric acid diluted with 2 fluid ounces of water and 1 ounce of high grade (98%) cyanid of potassium for every 100 cubic feet of space. A preliminary fumigation using half the above amounts and continuing the treatment two hours killed practically all the Psocids in the house and many fleas, while the usual amounts with a six hour fumigation destroyed all the fleas. The acid and cyanid are among our most deadly and virulent poisons and the same is true of the generated gas. Before treating, the house should be first carefully examined and every orifice or crack which would allow the egress of air should be carefully stopped. All fluids and liquid foods should be removed from the house and arrangements made so that the building can be opened from the outside after fumigation. The gas is generated by dropping the cyanid in large earthenware vessels containing the proper amount of diluted acid. It will be found advisable to have one or two of these jars in each room or hallway, and so arrange matters that the cyanid while still in the bag, can be dropped into one vessel after the other very rapidly, or else with a series of strings, dropped into all of the vessels at once. After the charge is set off the house should be carefully guarded so that no person can enter, and if it be in contact with others in a row, those in adjacent dwellings should also be warned so that the rooms next the treated building may be well aired during the fumigation, which should last from one to several hours. The building should then be thoroughly aired by opening doors and windows from the outside, and utmost pains taken to free the house of gas before any one be allowed to enter. The airing should last at least 30 minutes, and it will be preferable to extend this time to one, two or even three hours, dependent somewhat on the size of the building and the facilities for ventilation. One treatment should be sufficient but in the case of poorly constructed houses a second fumigation may be necessary a week or 10 days later. This dangerous operation should

be attempted only by those fully conversant with the nature of the materials with which they are dealing.

Shade tree and forest insects

Elm leaf beetle (Galerucella luteola Müll.). This species has won for itself a very bad reputation in the Hudson river valley on account of its extensive injuries to elms, particularly the European species. It is still extending the area of its operation. Last year it was detected in a limited portion of Saratoga Springs, and this season we were sorry to observe that it had spread over practically the entire village and would have caused material injury to the shade trees had it not been for the systematic and continued spraying conducted by the village authorities. An examination July 16 showed that the grubs were full grown in that locality and that many had pupated. We are inclined to believe that the second brood, if any, would be very limited in that section. This species has also been reported as present in very large numbers at Schuylerville, only a short distance from Saratoga Springs. It has become established over a considerable portion of Schenectady, where it is causing considerable injury and is likely to inflict more in the next year or two unless adequate measures are taken for its suppression. This insect as noted in Museum bulletin 64, has obtained a foothold at Ithaca N. Y. and we are in hopes that it will not be allowed to inflict serious injury on the beautiful trees of that city as it has on those of some others in the State. A detailed account of this species appears in Museum bulletin 57.

White marked tussock moth (Notolophus leucostigma Abb. & Sm.). This common enemy of shade trees annually attracts more or less attention on account of its ravages in different cities of the State, in spite of the fact that it is a comparatively easy one to control, not only on account of its eggs being deposited in conspicuous masses which may readily be removed from trees, but also because it is easily destroyed with arsenical poisons. In our preceding report we chronicled the abundance of this insect in Buffalo, and the present season has

been marked by a repetition of the injury, though the attack was not so severe as that of the preceding summer. The causes for this latter condition may be in part due to repressive measures adopted by citizens of that city, but on the whole we are inclined to believe that natural enemies or unfavorable climatic conditions were the most potent factors in reducing the numbers of this pest. The condition of the trees in that city is a most effective argument in favor of establishing a paid forester or other official whose duty it shall be to look after the street trees as well as those in the parks and see that they are adequately protected from insect ravages. This matter is one of increasing importance, as our cities are growing rapidly in size, and as a consequence there is a greater massing of foliage and therefore more favorable conditions for the development of large numbers of a species. It requires but a few years for insects to destroy a tree which may have been from 10 to 50 or more years in growing, and in cities where this is allowed a deterioration of real estate values must follow, accompanied by an increase of various diseases and a higher mortality, because of the rapid and extreme temperature changes due to the absence of trees.

This pest can be easily controlled in either one of two ways. Many of the caterpillars can be jarred or brushed from the infested trees, and their ascent prevented by the use of a band of loose cotton tied around the tree or a band of tar on a piece of stout paper, the latter to prevent injury to the tree. Both of these materials are very effective, and in our judgment vastly superior to the brass bands seen on the trunks of so many shade trees in Buffalo. Bands, however, are of value only in keeping the caterpillars off the trees. The jarring of the pests is somewhat laborious, and as the insects are readily detroyed by spraying with an arsenical poison a prompt application of some such material to the foliage is advisable. Arsenate of lead is one of the best poisons. It may be applied at the rate of 4 pounds to 50 gallons of water. Use this insecticide only in the prepared paste form, diluting to the proper extent, and under no conditions purchase the crystalline article. The older standard

poisons, paris green, london purple and similar preparations are very effective, though subject to washing by rains. These latter substances should be used at the rate of 1 pound to 100 gallons of water, with 1 pound of recently slaked lime to protect the foliage from burning. Spray thoroughly in any event and aim to cover so far as possible every leaf with the poison. Protective measures should be adopted early or the injury will be beyond repair. It is hardly necessary to add that it is impossible to grow magnificent trees if they are defoliated year after year, as unhappily seems to be the case in some cities in recent years.

Fall webworm (Hyphantria textor Harr.). This species appeared rather early in the season on various forest and fruit trees in different sections of the State, and in certain localities was somewhat abundant and destructive. Generally speaking it has not caused serious injury except in a few localities where no effort was made to check it. This species, like the two tent caterpillars, is readily controlled by spraying with an arsenical poison, and its conspicuous web nests, which serve as a retreat for the caterpillars, are easily removed from the tree and the inmates destroyed by crushing or burning.

Forest tent caterpillar (Malacosoma disstria Hübn.). As noted in our preceding report, Museum bulletin 64, page 104, the ravages of this pest are on the decrease, and the present season has witnessed practically no injury by this insect. A few caterpillars were observed in Rensselaer and Columbia counties but in no instance coming to our notice was a tree even partially defoliated. A lack of reports from other sections of the State indicates a like gratifying condition, and we are in hopes that this outbreak is practically ended and that the species will be comparatively innocuous for a number of years.

Walnut worm (Datana integerrima Grote & Rob.). The work of this insect is more or less evident each year, particularly in the western part of the State, and during the past summer our attention has been called to its ravages in Herkimer county, and we have observed a number of black walnut trees in Chautauqua county which have been from one half to two thirds or entirely defoliated by this caterpillar.

Beneficial insects

Chinese lady beetles (Chilocorus similis Rossi). The specimens obtained from the United States Department of Agriculture through the kindness of Dr L. O. Howard, and liberated in East Greenbush in August 1902 failed to survive the winter. A second shipment of 25 was received Aug. 13, 1903, again through the generosity of Dr Howard. These specimens were set at liberty at Kinderhook N. Y. on the estate of Mr L. L. Morrell, who is a large fruit grower. The tree selected was a large appletree badly infested with San José scale, near the barn and on the edge of the old orchard, close to his young pear orchard. There is an abundance of scale on the old trees, as well as on the young, and Mr Morrell has consented to refrain from treating these, in order to give the imported beetles an opportunity to demonstrate their value.

An examination Sep. 23, 1903, of the appletree where these insects were placed last August showed that eggs had been laid and a number of young were easily found. Four adult beetles, probably descendants of those originally established and nearly 20 larvae of varying size, from very young to nearly full grown, were found in the center of the tree. This is a quite large one and is very badly infested with the scale and there is every probability that there are many more ladybugs on it and near-by trees than were discovered, though a brief search failed to reveal any on the latter. The examination was purposely limited because of the difficulty of detecting the insects and the danger of crushing them in crawling about on the limbs. It certainly looks as though this introduction had been fully as successful as that of the preceding year and it is most earnestly hoped that some will survive the winter, in which event we may be able to demonstrate the utility of this insect in our climate.

Little black lady beetle (Pentilia misella Lec.). This little lady beetle is usually found toward the end of the season in orchards infested with San José scale, and we have on several occasions recorded its presence in some numbers. Anything relating to the abundance and effectiveness of predaceous insects is of interest, and it is gratifying to state that in October we found this

little species, far more abundant than we had observed it before, in a badly infested peach orchard in Orange county. The little beetles were so numerous that 20 or 25 could easily be counted on a small portion of the trunk of a peachtree, and undoubtedly some of them bore from one to several hundred of these little lady beetles. They were crawling actively over the infested tree and evidently looking here and there for insects suitable for their needs. It is a source of regret to state that in spite of the great abundance of these little lady beetles, there appears to be no very material diminution in the numbers of the scale insects, which literally swarmed on many of the trees. The worse infested ones were more attractive to the lady beetles than the others. We have yet to meet evidence showing that this species is very efficient in reducing the numbers of this scale insect.

EXPERIMENTAL WORK AGAINST SAN JOSÉ SCALE INSECT

The control of this pernicious insect is a problem of considerable importance in localities where it has become established. This work was begun by us in 1900, primarily for the purpose of testing the effectiveness and possibilities of crude oil applications. Our results show that a mechanical emulsion of this material can be used, and if great caution is exercised in its application, comparatively little or no injury follows. So many, however, have met with such ill success that we have also experimented to a considerable extent with other materials, specially since in the last year or two we have observed some evidences of injury to the bark after the application of oil. This first appears as an enlargement of the lenticels, which is evidently followed by a great increase in thickness and a very rough, unsatisfactory condition of the bark, and this has led us to question the advisability of continuing such applications year after year, and also to make further tests of materials which were free from this objection.

Early spring or winter applications

20% mechanical crude petroleum emulsion. The work with this insecticide was continued the present season in the experimental orchard, the application being made Mar. 3, to about 70 trees

representing a number of the more common varieties. It will be observed that the spraying was earlier than usual, and the weather conditions favorable, the day being dry with only a moderate amount of wind. This insecticide was applied as in the spring of 1902, to the following trees: numbers 15-28, 34-47, 60-74, 79-91 and 101-14; or in other words, to the western end of the experimental orchard, a map of which was published in our report for 1900. The general character of the trees and their varieties have been previously published, and may be ascertained by referring to the above publication. Tests of the mechanical dilution were made while the work was in progress with the following results: at tree 18 slightly less than 20%; at tree 39, 26%; at trees 45 and 46, 31%; at tree 84 slightly less than 20%, and at tree 101, 33% of oil. The above figures represent more variation than is desirable, and yet, so far as we were able to see, the trees suffered very little from the treatment. Inspection a few days after showed that all were well covered with oil, though in some cases where the bark was quite rough, it is probable that there were scales which escaped.

Examination of these trees the latter part of July showed that while a number of them were rather badly infested by living young, a great many were relatively free. The following were rather badly infested: trees 15, 16, 22, 38, 41-44, 73, 79, 82 and 86. The foliage on tree 101 was light in color, small in size and the growth only fair. It looked as though it had suffered some injury, and undoubtedly the petroleum had hurt the bark to some extent. This injury was also noticeable to a lesser extent on some other trees, the most common indication being much enlarged lenticels, which seemed to be followed by an excessive development of outer bark and a corresponding roughness, so that trees in this condition presented a somewhat bad appearance.

A general examination of the experimental orchard Sep. 25, showed that the section sprayed with petroleum emulsion was generally in much better condition than that treated with the lime-sulfur wash. A few of the trees in the petroleum section, notably 23, 41 and 75, were badly infested by numerous living

young which had evidently developed within the last two or three weeks.

The ultimate effect of successive applications of crude petroleum to various fruit trees is of some interest, and on this account we purposely made annual applications to certain trees, and an examination of them is not without interest, since while it shows some injury, the damage is not so serious as it first appeared. For example, tree 101, a seckel pear, was very badly infested in 1900, when it was sprayed with undiluted petroleum and seriously injured. The following year it was treated with a mechanical mixture consisting of 15% oil and a whale oil soap solution, 1 pound to 4 gallons, and in the spring of 1902 and of 1903, with 20% mechanical emulsion. The tree at the outset, as above noted, was in poor condition. It has been steadily improving, and last December had developed a large amount of new wood, and during the present season has made a fair growth, though the foliage is rather light in color and less than normal size. Tree 114, a pear of the same variety, received undiluted crude petroleum in 1900, but was not injured so seriously as 101. Each subsequent year it has been sprayed with a mechanical crude petroleum emulsion and is now in a vigorous condition and in much better state than three years ago, though the roughness of the bark on the trunk is becoming more pronounced. Tree 69, a Howell pear, was sprayed in 1900 with the whale oil soap and petroleum combination, and with mechanical petroleum emulsions the three succeeding springs, and is now in as good condition as others which have not been subjected to annual applications of oil. The same is practically true of tree 66, a Bartlett pear. Other instances might be cited, but enough has been given to show that ordinary fruit trees can stand at least four applications in successive years without much injury. The benefits resulting from this treatment in the vicinity of Albany, as compared with those accruing from the lime-sulfur combinations, were so marked that the owner has repeatedly urged us to apply the oil to the entire orchard, because the lime-sulfur wash had not proved satisfactory in controlling the scale. It is only fair to add that much better results have

been obtained with this latter insectide in some other portions of the State.

Lime-sulfur washes. Early experiments with this material were so unfavorable, that it was supposed to have no value in our eastern climate, though it had been used with great success in California. The matter was revived in later years, and recent tests have shown that under certain conditions, at least, very large proportions of the scale have been killed by the use of this insecticide. Our applications last year were somewhat unfortunate, in view of the fact that we failed to kill a satisfactory proportion of the insects, and in this respect our results were somewhat different from those obtained by other experimenters. The treatment was followed by continued heavy rains, and this, with oil from applications the preceding year may account for the noneffectiveness of the wash. Further experiments were conducted the present season for the purpose of testing the value of the preparation more thoroughly, and also for determining, if possible, the best wash to be employed. The early spring experiments were at Clinton Heights, and at Warwick. Two formulas, in particular, were tested: one which may be known as the 30-30-30 combination to 100 gallons, and the other the 40-15-20 to 60 gallons. Both gave excellent results at Warwick, where conditions were almost ideal for careful experimentation, and a modification possessing some advantages was also employed. This latter consists of 25 pounds of lime, 20 pounds of sulfur to 60 gallons of water. Unfortunately the experiments at Clinton Heights though carefully performed failed to yield the results we desired, partly on account of unfavorable conditions due to very large trees with rough bark being the only ones available. In our experimental orchard at Clinton Heights an application of lime-sulfur, using a 30-30-30 formula, was made to the same trees treated in this way the preceding year, and we regret to state that the results were not very satisfactory, though the application was more successful than that of 1902. The spraying was followed immediately by some snow and rain, and while this may have had a detrimental effect, it does not account entirely for the failure. It is possible that the extremely

rough bark on certain trees sheltered some of the scale insects from the application, and consequently it was only a short time before the trees were restocked by breeding. An interesting series of experiments was conducted at Warwick, the essential details of which are given in the table on page 156. Owing to difficulties in application etc., it was not always possible to regulate closely the period of boiling, and while our intention was to rigidly test the long and the short boil in each formula, as a matter of fact there was some variation as will be seen on consulting the table. The destruction of the scale, however, was all that could be expected, and it is very gratifying to state that Mr W. H. Hart of Poughkeepsie, whose large orchard is infested with this pest, was able by the use of a wash composed of 30 pounds of lime, 20 pounds of sulfur and 15 pounds of salt to 60 gallons of water to keep the insects in subjection in a very satisfactory manner indeed, though some of his trees were of considerable size, being 18 to 20 or more feet high. Mr Hart was careful to have the application made in the most thorough manner and he took pains to always work with the wind when spraying, and in this manner was able to obtain a maximum efficiency with a minimum amount of labor. Comparisons on trees which were sprayed on only one side gave most gratifying testimony to the efficacy of the wash, the treated portions being practically free, while the untreated were almost covered with the pest. Ben Davis seems to be much more susceptible to the scale than the Thompkins County King. Mr Hart is of the opinon that a small amount of rain, particularly a mist for a day or two immediately after spraying, is of value because it brings the caustic wash into more intimate contact with the scale. Mr L. L. Morrell of Kinderhook has also had excellent results from use of a lime-sulfur wash and the same is true of Edward Van Alstyne of the same place.

It is undoubtedly true that considerable variation is allowable without materially influencing the value of the application. A large amount of lime probably has some value because it forms a thicker coat over the branches and is therefore a more efficient mechanical barrier in preventing the establishment of young scale

Warwick experiment, applied March 25-27

Wash	COMPOSITION AND PREPARATION							PROPERTIES				Weather
	Lime	Salt	Sulfur	Resin	Copper sulfate	Water	Boil	Color	Sediment	Adhesiveness	Results	
1	30 lb	30 lb	30 lb	0	0	100 gal.	1½ hr	Dark amber	Very little	Good	Very effective, checking breeding almost entirely and probably killing most of the females	Cloudy with strong wind Fair, few days following
2	30 lb	0	30 lb	0	3	100 gal.	1 hr	Dark amber, bluish tinge	Very little	Good		
3	30 lb	0	30 lb	0	0	100 gal.	1½ hr	Dark amber	Very little	Good		
4	30 lb	0	30 lb	0	0	100 gal.	½ hr	Light orange	Little	Fair		
5	30 lb	0	30 lb	12 lb	0	100 gal.	45 min.	Dark amber	Some	Very good		
6	40 lb	15 lb	20 lb	0	0	60 gal.	1 hr	Amber	Little	Good		
7	40 lb	15 lb	20 lb	0	0	60 gal.	35 min.	Amber	Little	Good		
8	40 lb	0	20 lb	0	0	60 gal.	1 hr	Amber	Little	Good		
9	40 lb	0	20 lb	0	0	60 gal.	½ hr	Amber	Little	Good		
10	40 lb	0	20 lb	8 lb	0	60 gal.	40 min.	Amber	Much	Good		
11	25 lb	0	20 lb	0	0	60 gal.	2 hr	Amber, greenish tinge	Some	Good		
12	25 lb	0	20 lb.	8 lb	0	60 gal.	1 hr	Amber	Much	Fair		

insects. If too much lime is used it is liable to scale off; consequently there is a limit to the amount which can be employed, and for various practical reasons we are inclined to believe that 25 pounds of lime, 20 pounds of sulfur to 60 gallons of water is a very good proportion. The lime probably aids materially in holding the sulfur and its sulfids (which latter are undoubtedly among the most valuable constituents of the wash), and thus adds to the efficiency of the insecticide by preventing to some extent leaching of its active ingredients. Our experiments fail to indicate the necessity of prolonged boiling insisted on in so many formulas. In fact, it seems as though active boiling for 30 minutes meets every requirement. A wash prepared in this manner appears to be just as effective as one which has been boiled for a much longer time. Salt increases the specific gravity of the liquid and thus undoubtedly aids in keeping the solids in suspension, but so far as chemical action and insecticidal properties are concerned, it appears to have no value, and the same is true of its effect on the adhesive qualities of the wash. So marked is this that we have omitted it from the composition of the wash because of its very problematic value. We are still of the opinion that climatic conditions have considerable influence on the effectiveness of this insecticide, and believe that it should be applied when the trees are dry or nearly so, and that, in order to obtain satisfactory results, no large amount of rain should fall within three or four days after the spraying. This insecticide gives very good results wherever it can be applied thoroughly and has the advantage of being cheaper than any other winter wash, though it is decidedly more injurious to apparatus and exceedingly disagreeable to apply.

The resin solution [*see* p. 160 for preparation] was added to several of the washes in hopes that it would materially increase their adhesiveness and likewise their insecticidal properties, because such seemed to be the case in some preliminary indoor experiments. Field tests, however, failed to indicate any great advantage resulting from the addition of this material, except perhaps in the case of rains immediately following the applica-

tion. It affected the washes by making them more or less flaky, increasing the amount of sediment, and if much more had been added it would probably have seriously affected the operation of the pump. This material, if used, must be thoroughly diluted with warm water before being added to a cooler lime-sulfur wash, or it is likely to give trouble by gumming up the apparatus.

Summary. Our experience and experimental work may be summarized briefly, as follows:

A mechanical 20% crude petroleum emulsion is a very effective insecticide, and if the pump can be relied on to deliver a constant proportion, there is very little danger of much injury from several annual early spring applications. There is, however, some doubt as to the ultimate result, and the continued use of this material causes increased thickness and roughness of the bark, if no other injury.

Early spring applications of whale oil soap solution, even if only $1\frac{1}{4}$ pounds be used to a gallon, will control the insect in a very satisfactory manner, provided the spraying is thorough. We are by no means certain that this can be done on large trees, particularly those with rough bark.

The lime-sulfur combination is steadily gaining favor in the eastern states, and under certain conditions, at least, is fully as effective in checking the scale as either crude petroleum or a whale oil soap solution. Our experiments lead us to believe that 25 pounds of lime and 20 pounds of sulfur to 60 gallons of water, are equally as effective as larger amounts, and we believe it to be an advantage to have a little more lime than sulfur. We fail to see any beneficial results from the use of salt in this combination, and therefore have omitted it; and in our experience, active boiling for 30 minutes, if the lime is slaked in hot water and the sulfur added at once, gives just as effective a wash as one which has been boiled for one and one half or two hours.

In conclusion, the experience of Mr Hart and other up to date fruit growers, has demonstrated not only the possibility but the practicability of keeping this insect in control in an ordinary commercial orchard. Our observations show beyond doubt, that

this scale insect is a very serious enemy, and unless efficient measures are promptly adopted for its suppression, very great injuries may be caused.

Summer washes

This pernicious insect breeds with such extraordinary rapidity during the summer, that ordinary applications of whale oil soap or kerosene emulsion are not entirely satisfactory, since at the strengths usually employed only the crawling young and smaller scale insects are killed. It frequently occurs that an infestation is discovered in midsummer and the owner wishes to do something at once. The unsatisfactory results with the above named washes led Mr P. L. Huested, nursery inspector of the Department of Agriculture, to experiment with a mechanical 20% crude petroleum emulsion, which was applied in July with a kerowater sprayer to peachtrees. A test of this material was made in a very badly infested orchard in the summer of 1902, and beyond causing some of the foliage to drop where it was the thickest, particularly in places where a 25% emulsion was used, as was the case in certain areas, no serious injury to the trees followed the treatment. The results were so satisfactory that the same course was pursued last summer with equally gratifying effect so far as injuring the trees was concerned, though at the time it did not appear as if the application was effective enough in killing the scale. Subsequent observations, however, have shown that it was more beneficial than at first supposed. In spite of this, we still feel some hesitancy in recommending this treatment in summer, except, perhaps, where the pest is breeding in very large numbers.

This condition of affairs led us to undertake a series of experiments for the purpose of ascertaining if it were possible to make some combination which, while not injuring the foliage, would remain on the trees and be effective for some weeks after application, and at least kill the crawling young as they came from under the protecting scales of the females. The late Professor Lowe conducted some experiments along this line, and our work has been a continuation of that with modifications. It appeared to us as though a lime-sulfur combination, possibly without boiling, could

be made of a proper strength so that it would kill a large proportion of the younger scales, and we were in hopes that it would be powerful enough to destroy individuals emerging from females several weeks after application. The basis of these experiments was a standard wash which we had used the preceding spring with very gratifying results on dormant fruit trees. This wash contained 25 pounds of lime, 20 pounds of sulfur to 60 gallons of water. It was diluted to various strengths, and an effort made to ascertain whether boiling for 15 or 30 minutes had any material effect on the efficiency of the wash. In addition, a resin solution was used, which is prepared as follows: dissolve 3 pounds of sal soda in 3 quarts of water and add thereto 4 pounds of resin and boil till dissolved. While hot, make up to 5 gallons and keep boiling till the resin is well in solution. The resin was added simply to increase the adhesiveness of the wash, in hopes that if this were done the efficiency of the combination would be materially increased. In a few instances the lime-sulfur combination was used with the bordeaux mixture for the purpose of testing the value of this combined wash. The preparation and application of the washes was the work of Assistant C. M. Walker, who is also responsible for many of the field observations. The following table gives in a summarized form the various ingredients of the different washes and their effects on trees and scale and also the conditions under which they are applied. These experiments were conducted in our experimental orchard at Clinton Heights near the western boundary of East Greenbush.

Table of summer washes

		COMPOSITION AND PREPARATION								PROPERTIES				
Series	Wash	Lime	Sulfur	Resin	Salt	Water	Boil	Bordeaux	Application	Tree	Adhesiveness	Effect on foliage	Effect on scale	Weather
1	1	25 lb	20 lb	4 lb	0	240 gal.	0	0	After 2 hr stand	Young apple	Very poor	Uninjured	Kills crawling young only	Applied June 22, fair, with heavy showers on few following days
	2	"	"	0	15 lb	"	0	0	"	"	"	"	"	
	3	"	"	4 lb	0	960 gal.	15 min.	0	"	"	"	"	"	
	4	"	"	0	0	"	"	0	"	"	"	"	"	
	5	"	"	0	0	"	30 min.	0	"	"	"	"	"	
	6	0	0	0	0	0	0	50 gal.	"	"	Fair	"	"	
	7	0	5	1	0	0	0	"	"	"	"	"	"	
	8	5 lb	5 lb	0	0	0	15 min.	"	"	"	Good	"	"	
	9	"	"	1	0	0	0	"	"	"	Fair	"	"	
2	1	25 lb	20 lb	4 lb	0	60 gal.	0	0	After 2 hr stand	Young apple	Very poor	Uninjured	Kills crawling young only	Applied July 28, fair, with continuous rains for a number of days following
	2	"	"	"	0	120 gal.	0	0	"	"	"	"	"	
	3	"	"	"	0	60 gal.	15 min.	0	"	"	Very good	"	"	
	4	"	"	"	0	120 gal.	"	0	"	"	"	"	"	
	5	"	"	"	0	240 gal.	"	0	"	"	Very poor	"	"	
	6	"	"	"	0	480 gal.	"	0	"	"	"	"	"	
										Peach		Slightly burned		

Table of summer washes (*continued*)

		COMPOSITION AND PREPARATION								PROPERTIES				
Series	Wash	Lime	Sulfur	Resin	Salt	Water	Boil	Bordeaux	Application	Tree	Adhesiveness	Effect on foliage	Effect on scale	Weather
3	1	25 lb	20 lb	4 lb	0	60 gal.	0	0	After 2 hr stand	Old apple	Very poor	Slightly burned	No scale present	Applied August 14, fair, and days immediately following. Rain Aug. 16-20
	2	"	"	"	0	120 gal.	0	0	"	"	"	"	"	
	3	"	"	"	0	60 gal.	15 min.	0	"	"	Very good	Badly burned, leaves off	"	
	4	"	"	"	0	120 gal.	"	0	"	"	"	Burned, leaves retained	"	
	5	"	"	"	0	240 gal.	"	0	"	Old apple	Very poor	Uninjured	"	
										Peach		Tips slightly burned		
	6	"	"	"	0	480 gal.	"	0	"	Old apple	"	Uninjured	"	
										Peach		Tips slightly burned		
4	1	25 lb	20 lb	4 lb	0	240 gal.	15 min.	0	Immediately	Pear	Very good	Slightly burned	75 % killed	Applied August 21, fair and immediate days
	2	"	"	"	0	"	30 min.	0	"	Peach	"	Slightly burned	15 % killed	
										Pear		Slightly burned	85 % killed	
										Peach		Slightly burned	40 % killed	

5	1	25 lb	20 lb	4 lb	0	240 gal.	15 min.	0	Immediately	Old apple	Good	Slightly burned	85% killed	Applied Sep. 4, fair, warm and 3 following days. Heavy rains in October
	2	"	"	"	0	"	"	0	After 2 hr stand	"	"	"	Kills crawling young only	
	3	"	"	"	0	"	30 min.	0	Immediately	"	"	"	No scale present	
	4	"	"	"	0	"	"	0	After 2 hr stand	Pear	"	"	30% killed	
	5	"	"	"	0	480 gal.	15 min.	0	Immediately	Plum	Fair	Very slightly burned	Kills crawling young only	
	6	"	"	"	0	"	30 min.	0	"	Pear	Very good	Uninjured	"	
										Peach		Tips slightly burned		

Series 1. Nine different washes were applied June 22 in this series, and observations made at intervals from June 26 to Sep. 28. Very small amounts were used and the solutions allowed to stand two hours. Different results might have been secured if larger quantities had been employed and applications made at once. The spraying was done with a fine hand atomizer and treatment limited to young, badly infested appletrees which bore all stages of the scale. These trees had been set out only a few weeks and consequently made little growth, though the foliage was in fair condition. The various washes did not injure the leaves, and it will be noted that washes 1 to 5, which were either unboiled or very dilute, adhered poorly, while 6, 7 and 9 containing bordeaux were better in this respect, and 8, which was boiled and also contained bordeaux, was much better. None could be distinguished on the tree 10 days after application. All washes killed the majority of the crawling young but did not prevent the development of established scales or the growth of young appearing after treatment. There was very little appreciable difference in the various washes, and on Sep. 8 all the trees were badly infested by all stages, crawling young being specially abundant.

Series 2. Six washes were applied July 28 in this series, and observations made from July 30 to Sep. 8. The washes were prepared in substantially the same manner as indicated above, and applied to the same lot of trees with the exception of a branch of a peachtree which was sprayed with 6. The condition of the foliage and scale infestation was identical with that in series 1, and the weather conditions were similar. Apple foliage was uninjured by any of the washes, but peach leaves were slightly burned at the tips by wash 6. Washes 3 and 4 were boiled 15 minutes, were more adhesive than the others, and Aug. 10 showed good color but on Sep. 8 no trace remained. The crawling young only were killed.

Series 3. Washes in this series were applied Aug. 14 and were similar to those of series 2. Observations were made from Aug. 17 to Sep. 8, and the conditions, preparation, etc., were practi-

cally the same as in series 1. The applications were confined to portions of old appletrees except in cases of washes 5 and 6, which were also applied to peachtrees. The scale infestation was slight and the weather fair immediately following the treatment. Appletree foliage was injured by wash 3, which caused the leaves to shrivel and fall off, and 4 burned them slightly. Wash 5 burned tips of peach leaves, and 6 had the same effect. Numbers 3 and 4 adhered very well for three weeks.

Series 4. The two washes used in this experiment were applied Aug. 21 and observations made from Aug. 27 to Oct. 20. Relatively large amounts were used and the applications made immediately after preparation. The cyclone nozzle used gave a somewhat coarser spray than the atomizer employed in the first three series. Pear, plum, peach and mulberry trees were used in this experiment and most of them were badly infested. The foliage was in good condition, the weather fair and remained so for a few days following the spraying. Plum and pear leaves were injured by wash 1, particularly in the case of a pear where the treatment was specially thorough. This latter dropped its leaves, while another, which received less of the mixture, did not, though the foliage was evidently injured. Wash 2 seriously injured peach leaves and caused slight burning of plum and mulberry foliage. Wash 1 adhered very well and was present in thick layers Sep. 8 and traces of color could be detected Oct. 20. The same was true to a lesser extent of wash 2. Oct. 20, number 1 had destroyed 75% of the scale on a peartree, and the foliage was slightly burned. A number of limbs were dying on the tree, which had dropped its lower foliage and on which the scale was entirely dead. Only about 15% of the scale had been killed on the living branches. Wash 2 killed 40% of the scale on one tree and about 85% on the other, which latter was in very bad condition.

Series 5. Six washes were applied Sep. 4, and observations made at intervals from Sep. 6 to Oct. 20. Small amounts of the washes were used and the same nozzle was employed as in series 4. Apple foliage was slightly burned by washes 1, 2 and 3,

and pear leaves with wash 4. Plum foliage was injured very slightly by wash 5, and number 6 burned tips of peach leaves to a slight extent but did not injure pear foliage. Washes 1, 2, 3 and 4 adhered well, 5 and 6 more so, 6 in particular being thickly incrusted on limbs and foliage. Wash 1 killed 85% of the scale, and there was a marked contrast between sprayed and unsprayed branches. Wash 2 had no effect on the scale, while 4 killed 30%. The latter was boiled longer and this may account for its greater effectiveness. Variation in intervals between preparation and application appeared to have no effect on the adhesive or insecticidal qualities of these washes.

Summary. A mechanical 20% crude petroleum emulsion was applied in early July, two seasons in succession, to peachtrees without causing much injury beyond dropping some of the foliage where it was the thickest. It undoubtedly destroys a large amount of scale and seriously checks breeding, yet we hesitate to do more than state what it has accomplished. It is perhaps the best thing that can be used where a very bad infestation is discovered in midsummer.

A whale oil soap solution, 1 pound to 8 or 10 gallons; a kerosene emulsion (standard formula diluted with 6 to 10 parts of water), or a 15 or 20% mechanical kerosene emulsion can be used in midsummer for checking the San José scale, but none of these materials can be relied on to kill much more than the crawling young, and breeding is soon almost as bad as before the application unless treatments are frequent.

Our experiments with lime-sulfur combinations for a summer wash have not been as successful as was hoped, though 25 pounds of lime, 20 pounds of sulfur to 240 gallons of water with a 15 minute boil killed a large percentage of the scales on an old appletree in early September without materially injuring the foliage. It is barely possible that a combination of about this strength can be used with beneficial results, but nothing of the kind can be recommended till further experiments have tested its practicability.

DISEASED AND DYING TREES AND INSECT ATTACK

The connection existing between diseased and dying trees and insect depredations is not only one of interest, but also of considerable importance, since in some instances at least serious depredations have origin in a group of diseased or dying trees. It is well known for example that certain species exhibit a decided preference for trees in this condition, and when breeding therefrom in very large numbers are liable to attack healthy trees, if nothing more suitable is within reach. It is very likely for example that the more serious injuries by the elm borer, Saperda tridentata Oliv., and the elm snout beetles, Magdalis armicollis Say and M. barbita Say, begin in this manner. These three insects can at least complete their transformations in dead tissues and are known to work in those which are living, and it seems very likely that in some cases they first attack a sickly limb or tree, and then after becoming abundant are able to kill others which show no signs of lowered vitality. The same is true of certain bark borers belonging to the genus Tomicus which operate exclusively in coniferous trees. Our largest species known as the coarse-writing bark beetle, Tomicus calligraphus Germ., usually breeds abundantly in diseased bark and instances have come under our observation where this species not only ran a few galleries in living tissues, but evidently took part in a primary attack on a tree in apparently normal condition. It was assisted in this work by a smaller pine bark beetle, Tomicus pini Say, which operates in the thinner bark, about the middle portion of the trunk and on the larger limbs. This latter species very likely has more to do in killing trees than the form previously mentioned, but evidence at hand indicates that the larger as well as the smaller may have an important part in this destructive work when conditions are favorable. The destruction of trees by insects breeding from a few dying ones was well illustrated in the summers of 1900 and 1901, at which time a number of pines in the vicinity of Albany began to look unhealthy. Investigation showed that they were infested with bark borers, and later in the season

of 1900 and the following many of the borers emerged from these dying trees and entered others, in which latter they were presumably the prime cause of death. The evidence at hand leads us to believe that in this case the bark beetles were primarily attracted to certain trees because of reduced vitality, possibly as a result of the excessive drouth of the preceding year, and that all subsequent injuries were due to their abnormal abundance; since they issued from the infested trees in swarms and attacked those adjacent, and the insects breeding from the latter in turn invaded others more remote from the center of infestation. The obtaining of data along these lines is somewhat difficult, since it is dependent on favorable conditions, and the following account of observations made during the past season has an important bearing on one aspect of this subject.

Forest fires and insect attack. The annals of entomology contain very little regarding the relationship existing between forest fires and insect attack, and the extended burnings last spring in the Adirondacks, presented a most favorable opportunity for studying this question, so far as fires occurring at that time of year are concerned. The principal object was first to secure data on the rapidity with which insect injury followed fire, and second to learn if there was a connection between extended fires and serious damage by insects in adjacent forests. It is very probable that the time of year when the fire occurs, has considerable bearing on the liability of insects entering the trees and breeding in large numbers, and the same is true of the character of the fire. A forest fire which not only kills but burns trees so badly that there is a rapid drying of those standing is much less likely to be followed by insect attack than one where there is only sufficient burning at the base to kill, specially if death is not rapid. Ap. 30, May 15 and June 3 there were somewhat extensive fires in the vicinity of Big Moose, and investigations by assistant D. B. Young, July 2, showed that insect attacks had become nicely started in the burning of May 15, more advanced in that of April 30, while practically no signs of insect presence were observed in that of June 3. This would seem to indicate that the trees are not at-

tacked till from four to six weeks after the initial injury. Mr Young's investigations showed that trees entirely killed by the fire were less subject to attack than those which had been so severely scorched as to be nearly dead or in a dying condition. An examination July 3 of a large tract at Big Moose, which was burned over June 3 and was extinguished on the 18th, failed to show any insects working on these trees; in fact, within the fire zone they were scarce, only a few common moths and a lady beetle being observed; just outside this fire zone, where trees had been felled to keep the fire from spreading, a few spruce bark beetles, Polygraphus rufipennis Kirby had begun to attack the spruce. The trees were attacked in the following order: pine, spruce, tamarack, birch, hemlock, balsam, beech and maple.

Investigations by Mr Young on Aug. 12 of the area burned June 3 showed a remarkable scarcity of bark borers (scolytids) in the fire zone at Big Moose. This may possibly be explained by the fire occurring at a time when no brood of adults was able to take advantage of the favorable conditions, and it may also be that the injured trees were not attractive enough to the insects for some reason or other. In our own experience, we have come across several burnings where it would appear as though bark borers should be abundant, and yet examination has shown them to be present in very small numbers. The timber on the above mentioned area has been injured entirely by large buprestids mentioned in succeeding paragraphs, which cause comparatively little injury to the lumber. The section burned Ap. 30 was also examined, and the principal damage here had evidently been caused by the ambrosia beetles (mentioned in following paragraphs), since they operate in sapwood and produce the black pin holes which seriously affect the commercial value of lumber.

Pine. Investigations July 9 at Lake Clear Junction, where a fire occurred May 18, showed that the pine bark borer, Tomicus pini Say, was working in the living tissues of a tree which had been injured by the fire.

The work of this species should be followed soon by that of the sawyer, Monohammus confusor Kirby, or M. scutel-

latus Say, which begins its operations by depositing eggs in large slits in the bark. The grubs tunnel the inner tissues of the bark and in the course of a short time enter the sapwood and by winter probably pierce the trunk to a considerable depth, materially injuring the lumber for other purposes than firewood. Mr Young's investigations in both July and August disclosed no signs of injury by this species. Two specimens of Rhyncolus brunneus Mann. were taken by him July 9 at Lake Clear Junction from a pine injured by fire the previous year.

Spruce. This tree was first attacked by the spruce bark beetle, Polygraphus rufipennis Kirby, and the lined ambrosia beetle, Xyloterus lineatus Kirby. The former is a very common insect in the Adirondacks and undoubtedly causes a large amount of injury by killing trees, while the latter, working as it does in the sapwood and producing conspicuous black holes, seriously affects the merchantable value of considerable lumber. July 3 almost every spruce in the area burned Ap. 30 at Big Moose was attacked by these two insects, the first working near the top of the tree, while the latter operated in the lower portions of the trunk. Another ambrosia beetle, Gnathotricus materiarius Fitch, was also observed in small numbers in the base of one or two trees. On another section, where the fire occurred May 14, it was found that the spruce bark beetle, Polygraphus rufipennis Kirby, and the lined ambrosia beetle, Xyloterus lineatus Kirby, had just begun work, and a species of Chrysobothris was also met with on spruce. Burned areas in the neighborhood of Lake Placid were also visited, and it was found that on the section where a very severe fire occurred April 30, the insects began operations later than on the area burned over about the same time at Big Moose, where the fire was not so injurious to the trees. The fire at Lake Placid, occurring June 3, was less injurious than the one at Big Moose on the same date, and on July 9 the scolytids were just beginning to attack the spruce, indicating that trees which were merely scorched, but not so much as to kill them at once, are sooner attacked by insects.

Investigations of spruce Aug. 12 on the tract at Big Moose which was burned June 3 showed that trees giving no evidence of insect attack on July 3 were infested with the larvae of a buprestid, probably Chrysobothris scabripennis Lap. & Gory. This record is of interest as showing when the trees are likely to be infested by this class of borers, which operate largely in the sapwood and do not seriously affect the value of the lumber. This beetle was fairly common on standing but badly burned spruce. The buprestid showed a decided preference for larger trees, though those which were badly scorched so that the inner bark had dried were not infested. Two or three specimens of Xylotrechus undulatus Say were taken on spruce, and Phymatodes dimidiatus Kirby was also met with in sparing numbers. The bark borers noticed above had made considerable progress.

Tamarack. Investigations July 9 of a section burned May 14 at Lake Clear Junction resulted in finding a tamarack infested by a scolytid, possibly Tomicus pini Say. A specimen of Leptura, L. subhamata Rand., was also taken from a burned trunk.

Birch. The yellow birches at Big Moose on the tract burned over Ap. 30 were in early July, in many cases, slightly green at the top and were being mined by Dryocoetes eichhoffi Hopk.; specially was this the case where the trunks were scorched seriously enough to interfere with the circulation of sap. The common flat-headed borer, Chrysobothris femorata Fabr., was taken on a fallen birch. The pigeon tremex, T. columba Linn., was observed in small numbers on birch, but investigations showed that its attack was confined to more or less decayed trees. This insect was also met with under the same conditions on maple and beech trees. Birch trees were relatively free from insect attack in August, probably because the thin bark permitted rapid evaporation and the consequent drying was unfavorable for borers, through Dryocoetes had made considerable progress in the large trees.

Hemlock. The 6-spotted buprestid, Melanophila fulvoguttata Harr., was numerous at Big Moose July 3 in the

burning of Ap. 30, on large hemlocks. Though they were somewhat green, none were observed on very small dead trees. A cerambicid, Xylotrechus undulatus Say, was observed in some numbers. Examination of these trees Aug. 10 resulted in finding some infested which showed no evidence of insect attack July 3, the larvae of Melanophila fulvoguttata Harr. probably being the principal offender. This is perhaps to be explained by this buprestid being on the wing mostly during July, and consequently there would not be a serious infestation till after the adults had flown for a period.

Balsam. Investigations July 2 on an area near Big Moose, burned over Ap. 30 resulted in finding several specimens of Chrysobothris pusilla Lap. & Gory on this tree, while C. scabripennis Lap. & Gory, were fairly common on the standing but badly burned balsams. Investigations Aug. 12 showed that the balsam compared with spruce was quite exempt from attack, probably due to the thinness of the bark and consequently quick drying of the sapwood. The lined ambrosia beetle, Xyloterus lineatus Kirby, was found in small numbers in July and its operations had progressed but little in August.

Poplar. Examinations July 7 of an area near Big Moose burned over May 14 resulted in finding a large species of Xyleborus in poplar.

Conclusions. Investigations the present season have shown that, while a number of insects are liable to attack burned trees within four to six weeks after injury, no very material injury is likely to result during the summer, except possibly from the work of ambrosia beetles. The other species either confine their operations so largely to the bark or else occur in such small numbers that for the present they may be neglected. The ambrosia beetles rarely extend their operations to a greater depth than 2 or 3 inches and as a consequence a considerable proportion of the lumber will be free of injury. This would hardly prove to be the case if the trees are allowed to remain standing a second season, at which time they will undoubtedly offer at-

tractive shelters for a number of other borers, some of which may penetrate the wood to a considerable depth and damage it very materially for other than firewood purposes. While prompt cutting of burned timber is advised wherever practical, the evidence at hand is not sufficient to indicate any very urgent necessity of its being removed prior to the winter following the attack. The insects now in the burned trees (if the latter are allowed to remain) will probably appear another spring and be numerous enough to cause considerable damage at least to weaker trees in the vicinity of the burned areas, and their multiplication in such places may eventually lead to a considerable extension of the damage. This is particularly liable to be the case with evergreen trees, and in the vicinity of Albany we have observed several localities where bark borer attack appeared to start with one or more infested trees, and the affected area was gradually increased till a considerable number of pines were destroyed.

It is not only advisable to cut the burned trees so far as possible during the winter, but they should also be removed from the land or at least gotten into water, so that the insects now under the dead bark will be unable to emerge and continue the attack. The same end may be attained in the case of bark borers, and they are the ones most likely to injure standing trees, by peeling the bark from the logs. This will hardly be practised in this county, even if it were profitable—something requiring demonstration.

VOLUNTARY ENTOMOLOGIC SERVICE OF NEW YORK STATE

The work of the last four years has been continued and a number of valuable observations added to our previous reports. The season of 1902 was unfavorable for the development of certain forms of insect life, and the same has been true to even a more marked extent in 1903. The latter, however, will probably go down in history as a season when plant lice or aphids were abnormally abundant and injurious to a great many plants throughout the entire State. 36 voluntary observers were appointed during

the season and but 21 of them rendered reports. This is largely due to the general scarcity of forms which lend themselves readily to observation, and the depredations of plant lice are so similar that most observers were unable to report on the outbreak in a satisfactory manner. It will be noted that the following reports contain some negative statements, which are of value because they emphasize the abnormal scarcity of various species. Too much dependence can not be placed on these reports, because with some exceptions they may be called local and not representative even of the county. It will also be observed that there are a number of conflicting statements, due to the belief by some parties that dry weather is favorable to the development of plant lice, while others state most clearly that the great increase in numbers of these pests was subsequent to the rains. It may be stated that we have not enough data to explain this difference and we are content at present to give opinions as they are transmitted. The observers all agree in reporting very cold, inclement weather in the early part of the season, and this undoubtedly had considerable effect in checking the appearance or in reducing the destructiveness of some of our more common injurious species.

Albany county [E. T. Schoonmaker, Cedar Hill]—Forest tent caterpillars (*Malacosoma disstria* Hübn.) hatched in limited numbers Ap. 23 and apparently have not suffered by the freeze. These insects caused practically no injury later in the season and consequently no report was made regarding the same. Elm leaf beetles (*Galerucella luteola* Müll.) occurred in limited numbers but were not abundant enough in the country to cause material damage.

Cattaraugus county [C. E. Eldredge, Leon]—Complaint of a looper caterpillar, probably a species of canker worm, was received June 10 with the statement that they had been observed on forest trees in that vicinity for several years, and that previously they had not appeared on appletrees. These insects were so near maturity that on June 17 no specimens were to be found. A soft scale (*Lecanium ? pruinosum* Coq.) was taken in some numbers from a trumpet vine. The unusually cold, inclement

weather kept insects well in control, and as a consequence there was comparatively little to report from this section.—*June 10*

Cattaraugus county [F. A. Fitch, Randolph]—Appletree tent caterpillars (Malacosoma americana Fabr.) appeared the latter part of April and were very abundant in neglected orchards, increasing immensely in numbers during the last two or three years. Squash bugs (Anasa tristis DeGeer) ruined a crop of squashes in this section last year. Cabbage butterflies (Pieris rapae Linn.) appeared about the middle of May, and the same was true of May bugs, species unknown, and various mosquitos. The white grub of the May beetle has not been as destructive as in former years.—*May 18*. Potato beetles (Doryphora 10-lineata Say), grasshoppers and the plum curculio (Conotrachelus nenuphar Herbst.) made their appearance May 26. Early in June curculios were reported as being at work, potato beetles as laying eggs, and plant lice as being present on cherrytrees. The latter are the ordinary black species (Myzus cerasi Fabr.) which has been unusually destructive and injurious in various sections of the State. Squash bugs appeared June 18, horn flies (Haemotobia serrata Rob. Desv.) the second week in June, and rose beetles (Macrodactylus subspinosus Fabr.) were very abundant on some rose bushes. Potato beetles are somewhat abundant and are laying eggs on potatoes. So far this season insects appeared to be less injurious than usual, probably on account of cold rains. —*June 22*. Large, green horseflies are quite troublesome and young grasshoppers are numerous on lowlands. Insect depredations are less than usual.—*July 8*. There are few mosquitos in the village and on the farm we saw none where commonly there have been millions. Ditching the land has undoubtedly aided very much in reducing their number. Flies are also less abundant than usual.—*July 22*. The first cabbage butterfly was observed in the field Aug. 11. A single mosquito was observed recently, though none had been seen for weeks before. Cabbage maggots (Phorbia brassicae Bouché) are working to some extent on cabbage, and the same is true of the cabbage louse

(Aphis brassicae Linn.) Grasshoppers are scarce as well as most other injurious insects.—*Aug. 17*

Cayuga county [Purley Minturn, Locke]—Appletree tent caterpillars (Malacosoma americana Fabr.) were observed for the first time May 5. Farmers have begun spraying. Very few injurious insects appeared owing probably to the extremely cold and frosty nights.—*May 5.* Colorado potato beetles (Doryphora 10-lineata Say) are very plenty, and the small, black flea beetle (Crepidodera cucumeris Harr.) is at work on potatoes and also feeding on various weeds in the potato field.—*June 11*

Chemung county [M. H. Beckwith, Elmira]—Cabbage butterflies (Pieris rapae Linn.) appeared Ap. 23. The Indian Cetonia (Euphoria inda Linn.) was observed May 1, and appletree tent caterpillars (Malacosoma americana Fabr.) the 2d. The latter do not appear to be as numerous as usual at this season of the year.—*May 8.* Currant worms (Pteronus ribesii Scop.) appeared on gooseberries May 8, asparagus beetles (Crioceris asparagi Linn.) May 11 and potato beetles (Doryphora 10-lineata Say) were first observed May 16. There were at this time no depredations of special importance.—*May 25.* Plant lice have been very abundant on plum and cherry trees but since the rains they are less numerous. Potato beetles are not very abundant and their eggs are developing slowly.—*June 30.* This has been a most remarkable season for insect depredations, as there have been very few species observed during the protracted dry weather. Early in the summer plant lice were quite abundant on cherry and plum trees and threatened for a time to cause considerable injury, but the wet weather came soon enough to prevent any great damage. Currant worms were less numerous than last year and the second brood was very small. Potato beetles were less destructive than usual and occurred in very small numbers. Cutworms were quite numerous, yet they caused less damage to plants than usual. Tobacco worms (Phlegethontius 5-maculatus Hübn.) were very scarce, in fact, only two were met with

this season, though much time was spent in tobacco fields. The striped cucumber beetle (Diabrotica vittata Fabr.) and the squash bug (Anasa tristis DeGeer) have been so few in number that their attacks were not noticed. The fall webworm (Hyphantria textor Harr.) was rather more abundant than last season.—*Oct. 8*

Dutchess county [H. D. Lewis, Annandale]—Appletree tent caterpillars (Malacosoma americana Fabr.) were first observed Ap. 20, and forest tent caterpillars (Malacosoma disstria Hübn.) on the 30th. A very few bud moth larvae (Tmetocera ocellana Schiff.) were observed May 1. Cold weather has kept insects in check and no species is remarkably abundant.—*May 4.* Tent caterpillars are, so far, much less abundant than for the past five years. The weather continues cold and dry and insects and fungi are developing slowly.—*May 12.* Tent caterpillars of both species are reported as causing some injury. Plant lice (Aphis mali Fabr. and Myzus cerasi Fabr.) are exceedingly abundant on apple and cherry trees respectively.—*May 27.* The latter have appeared recently and they are the only insects which are at all abundant. The weather continues cold and dry.—*June 1.* There is a great decrease in the number of caterpillars from last year and plant lice are exceedingly abundant.—*June 15.* Plant lice are still increasing and are the only insects which are of much importance. Tent caterpillars, both species, are not nearly so abundant as in former years. The weather is very wet at present.—*June 22.* Apple plant lice are present in enormous numbers and more abundant than they have been for 10 years. There are a few cutworms but other insects are scarce. The weather continues cold and very wet.—*June 25.* A very serious attack of pear psylla (Psylla pyricola Forst.) has developed within the last 10 days, and the crop will be seriously hurt. Apple aphis is still present in very large numbers, and potato beetles (Doryphora 10-lineata Say) are remarkable for their scarcity.—*July 10.* The apple aphis and the pear psylla continued in great abundance and have inflicted very serious damage, specially the latter. The

weather has been very wet and cold since June 1, and apparently favorable for the development of the above insects. The peartrees have suffered extremely, all the young growth being killed, and they are now starting a new growth from next year's buds. This wood can not ripen and the results must be very injurious. We visited one pear orchard of 600 trees where Psyllas were still very active and attacking the new growth as fast as it appeared. The pear crop in this section is ruined.—*Aug. 10*

Erie county [J. U. Metz, Swormville]—Striped asparagus beetle (Crioceris asparagi Linn.) was observed today for the first time. We have not been able to find any of the spotted species (C. 12-punctata Linn.). Quite a little wheat is down but we have not been able to detect any work of the Hessian fly (Cecidomyia destructor Say).—*May 28.* Currant worms (Pteronus ribesii Scop.) were observed yesterday in numbers for the first time. Rose beetles (Macrodactylus subspinosus Fabr.) are exceedingly numerous and causing considerable damage. Both moth larvae (Tmetocera ocellana Schiff.) are quite numerous and causing some injury. Not a trace of Hessian fly has been observed. Many young shoots of blackberries are affected by the gouty gall beetle (Oberea bimaculata Oliv.). Potato beetles (Doryphora 10-lineata Say) are numerous on early potatoes.—*June 11.* Rose beetles are very numerous and in one instance were so abundant that some cherrytrees were literally covered with them and looked as though they had been scorched by fire; not only the foliage but also the fruit was affected, and the insects were not above eating the grass beneath the trees. Grapevines are also being injured to some extent by these pests.—*July 6*

Genesee county [J. F. Rose, South Byron]—Cabbage butterflies (Pieris rapae Linn.) were first observed May 6, and potato beetles (Doryphora 10-lineata Say) were first noticed May 7. Tent caterpillars (Malacosoma americana Fabr.) are scarce as yet. The extremely cold, inclement weather of early May has kept many insects in check.—*May 11.* Cabbage worms were first observed on plants the 22d. Asparagus

beetles (Crioceris asparagi Linn.) are plenty. There are not many potato beetles as yet. Cigar case-bearers (Coleophora fletcherella Fern.) are very numerous in some orchards. Something has happened to tent caterpillars, as they are extremely scarce; so evident is this that it is a source of common remark. There are no evidences of injury by cankerworm.—*May 25.* The cabbage root maggot (Phorbia brassicae Bouché) is unusually numerous and very destructive to early cabbages. The four-lined leaf bug (Poecilocapsus lineatus Fabr.) is quite abundant and, as usual, is indifferent as to what kind of plant it attacks, occurring with great impartiality on burdock, peppermint, sage, currant etc. Cankerworms are very scarce in this immediate vicinity, but are reported as having done considerable damage in orchards between here and Rochester. In a trip to Niagara Falls I observed several orchards between LaSalle and that place, which were brown from the work of this pest.—*June 3.* There is practically no Hessian fly (Cecidomyia destructor Say) as after inquiry at a grange meeting, only one farmer reported any, and that was in a field of late sown no. 6 white wheat. A similar inquiry regarding cankerworms and tent caterpillars resulted in statements that very few or none had been seen. There is some complaint of plant lice on plum and cherry trees.—*June 15.* The black or cucumber flea beetle (Crepidodera cucumeris Harr.) is much complained of and has not only perforated potato leaves but is said to be at work on corn and beans as well as tomatoes. The striped cucumber beetle (Diabrotica vittata Fabr.) is very numerous on squash, melon and cucumber vines, nearly destroying them in some gardens. Following our severe drouth we have had three weeks of drizzling rain, and plant lice are very bad on fruit and other trees. We have never seen them on so many varieties of trees till this year. The young growth of quinces for 6 or 8 inches on each shoot is a mass of lice, and the leaves are blackened and rolled up. This plant louse outbreak has been exceedingly severe and injurious to a great many plants. There is a very general complaint among cabbage growers about the root

maggot. The cabbage plant louse (Aphis brassicae Fabr.) is also abundant, curling the leaves and turning them blue.—*June 29.* Fall webworms (Hyphantria textor Harr.) appeared July 2 and are now quite numerous. The squash bug (Anasa tristis DeGeer) has not appeared. There was a fair crop of striped cucumber beetles and they have now disappeared. Cabbages are white with cabbage aphis. This is the first time this insect has been a serious pest in this locality. Plant lice are also exceedingly abundant on fruit trees. Pear psylla (Psylla pyricola Forst.) is very abundant and seriously injuring the crop.—*July 2.* Fall webworms are unusually numerous, and potato growers have had little difficulty in controlling the potato beetle. Cabbages are very seriously affected by the aphis. Not a squash bug has been seen.—*Aug. 17*

Greene county [O. Q. Flint, Athens]—No injurious insects have been observed except tent caterpillars (Malacosoma americana Fabr.), which appeared later than usual and are much scarcer at this date than has ever been known before. The weather was extremely dry and growers are spraying pear and plum trees.—*May 20*

Herkimer county [George S. Graves, Newport]—Black butterflies (probably Euvanessa antiopa Linn.), were observed for the first time Ap. 25, and the same is true of the cabbage butterfly (Pieris rapae Linn.). Cold winds and cloudy weather seem to have delayed the appearance of insects.—*Ap. 28.* Webs of the appletree tent caterpillar (Malacosoma americana Fabr.) began to appear Ap. 30 and were by no means abundant May 6. The weather has been too cold for any rapid increase in insect life.—*May 7.* Plant lice have appeared on wild cherrytrees, and the currant worm (Pteronus ribesii Scop.) is at work, both eggs and larvae being found. No nests of tent caterpillars have been observed this week. The weather is warm and dry.—*May 14.* Potato beetles (Doryphora 10-lineata Say) were observed May 16, and currant lice (Myzus ribis Fabr.) were just appearing on the leaves on the same date.—*May 21.* Black flea beetles (Crepi-

dodera cucumeris Harr.) are appearing on potato leaves, and some insect is feeding quite generally on plantains, (very probably Dibolia borealis Chev.). Horn flies (Haematobia serrata Rob.-Desv.) are quite numerous on cattle. An examination shows that eggs of the currant worm are abundant. Elm foliage is full of holes, probably the work of larvae of the elm flea beetle (Disonycha triangularis Say).—*May 27.* Terminal leaves of elms are badly twisted and wrinkled by aphis attack, very probably Schizoneura americana Riley. Potato beetles are very rarely seen, though many eggs have been observed. The foliage of the few potatoes above ground is badly eaten by the black flea beetle. Nests of the appletree tent caterpillar are very scarce and with but few tenants. Currant aphis continues abundant.—*June 3.* Rose beetles (Macrodactylus subspinosus Fabr.) were observed for the first time on rosebushes June 4, and considerable damage has been inflicted. A species of plant louse (Chaitophorus negundinis Thos.) has appeared somewhat abundantly on the ash-leaf maple. Grasshoppers are becoming quite abundant in old pastures. The scarcity of potato beetles is cause for general comment, and the black flea beetles are exceedingly numerous on potato and tomato vines.—*June 10.* A few full-grown forest tent caterpillar larvae (Malacosoma disstria Hübn.) were observed. Spittle insects are uncommonly abundant on grass under a spreading shade tree. Rose beetles (Macrodactylus subspinosus Fabr.) are abundant on appletrees, on thorn apple, and very numerous on white daisy and dock. The daisy flowers are eaten off in many instances.—*June 17.* Potato beetle larvae were observed on one plant June 22, and a few striped cucumber beetles (Diabrotica vittata Harr.) were noticed on lima beans. The currant aphis (Myzus ribis Fabr.) is causing very little damage, while tomato and potato vines are considerably injured by the black flea beetle.—*June 24.* Currant leaves appear as though they had been eaten by the sawfly, though no larvae have been observed. The little plant louse (Drepanosiphum aceri-

folii Thos.) appears to be quite common on a number of varieties of maple and is causing some injury.—*July 1.* Black-headed cabbage worms (Evergestis stramenalis Hübn.) are causing some injury to turnips. Some caterpillars, probably fall webworms (Hyphantria textor Harr.) have appeared in small numbers on an appletree. Plant lice are abundant on many plants, such as apple, elm, box-elder, birch, wild cherry, burdock, pigweed and dock. Though potato beetles were never so inconspicuous, there are plenty of grubs.—*July 22.* The maple aphis (Drepanosiphum acerifolii Thos.) appears to be the cause of much premature falling of leaves, the pests being generally distributed, occurring even in the tops of trees 60 feet high. Plant lice have appeared in some numbers on red rose bushes.—*July 29.* There is apparently another brood of black-headed cabbage worms at work, if size is any indication. Plant lice (probably Aphis brassicae Linn.), are numerous on turnips. The appletree plant louse (Aphis mali Fabr.) is abundant and seriously injuring appletrees. The pests are specially abundant on new, tender shoots. Cherrytrees are very little affected, and plumtrees more so, but in the latter case black knot is also prevalent. Grasshoppers are generally scarce, though in a few localities they are abundant. Cabbage butterfly (Pieris rapae Linn.) has not been very abundant so far this season.—*Aug. 4.* A psocid (Psocus ? venosus Burm.) was found in clusters of 200 or more on the trunks of maple, and a few were also observed on appletrees. In some cases the bark of the tree seemed to be whitened as though it were partially eaten, probably by the insects gnawing away the lichens and outer portions of the bark. Larvae of the elm flea beetle (Disonycha triangularis Say) are very plentiful on elmtrees near by and have severely injured the foliage.—*Aug. 12.* A small, yellowish leaf hopper (? jassid) is abundant on beans and has apparently caused considerable yellowing of the foliage. Yellow-necked appletree worm (Datana ministra Drury) is present in small numbers, and the same is also true of the fall webworm. The brown and black woolly bears (Pyrrharctia isabella

Abb. & Sm.) were unusually numerous in a timothy field.—*Aug. 12.* Plant lice are numerous on beans, and on sunflowers there is a similar species. Codling moth larvae (Carpocapsa pomonella Schiff.) have begun operations, and wormy apples are not uncommon. Plant lice continue abundant on pigweed.—*Aug. 19.* Horn flies (Haematobia serrata Rob.-Desv.) and horseflies have been very troublesome for the past two weeks. A few caterpillars of Apatela americana Harr. were observed on soft maple today. Fall webworms (Hyphantria textor Harr.) are apparently more abundant than last year, occurring in some numbers on appletrees. Hornet nests are more numerous than usual.—*Aug. 25.* Butternut trees are very badly eaten in some places by Datana integerrima Gr. & Rob. Fall webworms continue to be unusually abundant.—*Sep. 1.* Plant lice (Chaitophorus negundinis Thos.) still continues abundant on box-elder. Apples are comparatively scarce this year and appear to be wormier than ever. A few webworm nests were observed on lilac and alder today.—*Sep. 16.* Pieris larvae are injuring foliage of cultivated nasturtiums to a considerable extent.—*Oct. 1*

Onondaga county [Mrs A. M. A. Jackson, Camillus]—First nest of an appletree tent caterpillar (Malacosoma americana Fabr.) was observed Ap. 26, and the present indications are that this insect will not be as abundant as usual. There is a report that Hessian fly (Cecidomyia destructor Say) is working in some fields.—*Ap. 28.* The blue or meat fly is quite abundant about houses. Cabbage butterflies (Pieris rapae Linn.) are about, though not numerous. Spotted lady beetles occur on many weeds and plants, and though abundant do not appear to be destructive. Tent caterpillars are not numerous and are causing very little injury. Cold, inclement weather has kept caterpillars and other insects in check. Examination of one wheat field showed no Hessian fly, and growers state that thus far none has been met with.—*May 6.* Cankerworms appeared May 12 and are quite abundant and destructive. The bud moth (Tmetocera ocellana Schiff.) is at work on appletrees, though

not causing very much injury. The forest tent caterpillar (Malacosoma? disstria Hübn.) has appeared in very small numbers on chokecherry trees. The weather is dry and warm and consequently favorable to the development of insect life. Many clover leaves have small, round holes eaten in them, possibly the work of the clover leaf weevil (Phytonomus punctatus Fabr.).—*May 13.* Cankerworms are developing rapidly and have caused a great deal of injury. Ants of several species are quite abundant.—*May 20.* Red admiral butterflies (Vanessa atalanta Linn.) have appeared but are not as abundant as usual. The appletree tent caterpillar is quite scarce, only five webs or nests being observed in a 5 mile drive. Cankerworms are abundant, and while many trees have been injured to a considerable extent, none have been entirely defoliated. Potato beetles (Doryphora 10-lineata Say) have appeared and deposited some eggs. Cold weather is keeping insects in control. Green plant lice are somewhat abundant on rosebushes. Currant worms (Pteronus ribesii Scop.) are present in small numbers, though not causing much damage. Red admiral butterflies continue scarce and others are not so numerous as usual. Potato beetles and their eggs are very abundant on early potatoes. A white frost occurred May 31 and June 1, but did not seriously affect insects.—*June 1.* Plum curculios (Conotrachelus nenuphar Herbst.) have stung much fruit and considerable is dropping. Cankerworms have about all disappeared and have not caused as much injury as in former years. Many farmers think that tent caterpillars hatched during the warm days of March and were killed by the cold weather which followed, or else perished from lack of food. This hardly seems probable, as instances have been recorded where eggs of this species hatched in the fall and the caterpillars successfully survived the winter in the latitude of Missouri.—*June 10.* There are but few cocoons of the tent caterpillars, and this appears to be due in part to the continuous wet weather of 1902, when the caterpillars ate but little, were not healthy and appeared to be only partly grown at the time they spun up. A very

few Hessian flies are to be found in the "flaxseed" stage, though no complaints of their work have been received. A leaf miner, probably Pegomyia vicina Lintn., is very abundant in a large field of beets. Spittle insects are quite common in certain fields of grass. Potato beetle eggs are hatching, but the grubs do not appear to be as numerous as the old ones and are causing comparatively little damage. Black flea beetles (Crepidodera cucumeris Harr.) have caused some injury to both tomato and potato vines. Striped cucumber beetles (Diabrotica vittata Fabr.) are present on pumpkin vines but are not causing much injury. No squash bugs (Anasa tristis DeGeer) have been observed this year, though they are usually very abundant and destructive in this section. Rose beetles (Macrodactylus subspinosus Fabr.) are quite destructive to rose bushes, though late in appearing, and leaf hoppers have also caused some injury to rose bushes. Peas are more free from weevils (Bruchus pisorum Linn.) than usual, but the vines are being eaten by a green worm similar to the cabbage worm. House flies are not as abundant as usual.—*June 29*

Orange county [J. M. Dolph, Port Jervis]—A few mourning cloaks (Euvanessa antiopa Linn.) and some Colias butterflies have appeared. Many small bees are frequenting plum blossoms.—*April 23.* Plant lice (Aphis mali Fabr. and Myzus cerasi Fabr.) are very numerous, specially on apple and cherry trees and rose bushes. Tomato plants are also affected by a species of plantlouse which may be Rhopalosiphum solani Thos. In general there are fewer insects than usual, due probably to the exceedingly dry weather.—*June 2.* Potato beetles (Doryphora 10-lineata Say) have made their appearance in considerable numbers, the first abroad on May 20, and the first larvae being observed June 9. Hundreds of lady-beetles were found on a crimson rambler rose, three or four on a leaf. We have never seen them in such great numbers before. This bush had been badly infested by plant lice, and the lady beetles were undoubtedly attracted by their prey. The currant

worm (Pteronus ribesii Scop.) has caused some injury though it has not been abundant as in former years. The spiny elm caterpillars (Euvanessa antiopa Linn.) have stripped the leaves from a number of North Carolina poplars planted for shade tree purposes.—*June 11.* Striped cucumber beetles (Diabrotica vittata Fabr.) have appeared in considerable numbers. Pear and cherry slug (Eriocampoides limacina Retz.) is inflicting much injury on the foliage of peartrees. Rose beetles (Macrodactylus subspinosus Fabr.) have been specially numerous and abundant this year. The foliage of very few bushes has escaped being eaten or seriously disfigured.—*June 30*

Rockland county [S. B. Huested, Blauvelt]—Appletree tent caterpillars (Malacosoma americana Fabr.) appeared as usual but have not done as much injury as in former years. No potato beetles have appeared, while plant lice (Myzus cerasi Fabr. and M. ribis Fabr.) are unusually abundant on cherry and currant bushes. Cutworms are reported rather plenty and cedar birds have been unusually numerous on cherry-trees, probably being more noticeable on account of the scarcity of fruit.—*June 7*

St Lawrence county [C. J. Locke, Ogdensburg]—June bugs and grubs were abundant May 1. 90% of the birch trees in this section are affected by a borer, possibly the bronze birch borer (Agrilus anxius Lec.), and an equal proportion of poplar trees are also injured. These latter may possibly be affected by a buprestid, though it is not improbable that considerable damage is caused by the poplar borer (Saperda calcarata Say). The gouty gall beetle (Oberea bimaculata Oliv.) is causing considerable injury in blackberry patches. Appletree borers (Saperda candida Fabr.) are abundant and infest many appletrees. Woodpeckers are at work on infested trees, and have undoubtedly destroyed many grubs.—*May 16.* Mourning cloak butterflies (Euvanessa antiopa Linn.) were first observed May 18, and cabbage butterflies (Pieris rapae Linn.) on the 22d. Currant worms (Pteronus ribesii

Scop.) put in appearance May 18, and the same is true of the appletree aphis (Aphis mali Fabr.).—*May 22.* Eggs of the potato beetle (Doryphora 10-lineata Say) were observed May 21, and shad flies or May flies, the 22d. Mosquitos were abundant on the 25th. Generally speaking, no insects are specially injurious.—*May 28.* Cucumber beetles (Diabrotica vittata Fabr.) were very numerous June 4; same was true on the 10th of strawberry weevil (?Anthonomus signatus Say) and potato beetles. White grubs are abundant and totally destroying oats.—*June 11.* Cabbage worms appeared on the 20th, and onion maggots (Phorbia ceparum Meigen) were at work the 22d. This latter insect has destroyed one fourth of the onion crop. Cabbages have likewise suffered from the maggot (Phorbia brassicae Bouché). Rose slugs were observed at work on the 23d.—*June 25.* A second brood of currant worms appeared July 1. Cabbage worms, cucumber beetles, plant lice and onion maggots are very numerous and destructive. The wet weather continues, accompanied by an increase of leaf-eating insects. The foliage of appletrees, plumtrees, maples and elms are all attacked by plant lice. Some apples are dropping and show no sign of injury except at the end of the stem, probably the work of the codling moth (Carpocapsa pomonella Schiff.).—*July 9.* Crane flies and dragon flies were numerous July 10, and a single specimen of the tomato worm (Phlegethontius 5-maculatus Haw.) was observed on the 15th. Cabbage worms, potato beetles and plant lice continue abundant and destructive. Mosquitos are abundant and rains continue. Striped cucumber beetles and plant lice are attacking vines, egg plants and wild tansy.—*July 16.* White marked tussock moths (Notolophus leucostigma Abb. & Sm.) were observed July 20, and dragon flies on the 15th. Potato beetles are abundant and plant lice very numerous, mosquitos are rare. Cool and wet weather has interfered with the successful application and efficiency of insecticides, and as a consequence caterpillars are abundant. Apples are dropping from the tree, and only about one quarter of the crop will be saved. Most of the trouble is

probably caused by the codling moth larvae.—*July 30.* Fall webworms (Hyphantria textor Harr.) appeared July 15 on plum, apple and elm trees, and a species of sawfly on asters.—*Aug. 8.* Potato beetles continue numerous and destructive. Cool, wet weather has not affected the leaf-eating caterpillars or plant lice, both of which continue abundant.—*Aug. 14*

Saratoga county [C. W. Ferris, Schuyler]—Appletree tent caterpillars (Malacosma americana Fabr.) are present in some numbers and were not injured by a frost, the mercury dropping to 24 F. on May 2.—*May 5.* Cherry aphis (Myzus cerasi Fabr.) are abundant on sweet cherries, and a green plant louse is affecting Bosc peartrees very seriously.—*July 15*

Schenectady county [Paul Roach, Quaker Street, Schenectady co.]—Appletree tent caterpillars (Malacosoma americana Fabr.) are just hatching on trees in warm situations. Their numbers are small, and but few egg clusters have been observed.—*May 1*

Schuyler county [Mrs Harriet S. Updyke, Logan]—Appletree tent caterpillars (Malacosoma americana Fabr.) appeared for the first time May 8. They have not caused as much damage as usual.—*May 20*

Ulster county [George S. Clark, Milton]—Appletree tent caterpillars (Malacosoma americana Fabr.) have been at work for two weeks and were not affected by the frost of April 12, even though they were not protected by a web.—*Ap. 23.* Tent caterpillar nests are present in large numbers except in localities where they were carefully destroyed the preceding year.—*Ap. 30.* Tent caterpillars continue to increase in size, and their nests are becoming more conspicuous. Aphis (Myzus cerasi Fabr.) are beginning to appear on cherrytrees. Currant worms (Pteronus ribesii Scop.) are abundant on bushes that were not sprayed last year, and a few occur on those that were treated.—*May 14.* There has been no increase in appletree tent caterpillars, and currant worms are few, specially on bushes that were sprayed last year. Plant lice (Myzus cerasi Fabr.) are increasing on

cherrytrees, and it is now too late to reach them because the leaves are so badly curled. Some plant lice (Aphis mali Fabr.) have developed on appletrees. The black flea beetle (Crepidodera cucumeris Harr.) is working on potato, tomato vines and eggplants. Some caterpillars, probably those of the gartered plume moth (Oxyptilus periscelidactylus Fitch) are not doing much damage.—*May 21.* Tent caterpillars are beginning to crawl, evidently preparatory to pupation, and are not more than one quarter as abundant as last year. Plant lice are numerous on cherrytrees, specially young ones. The red spider (Tetranychus telarius Linn.) is abundant on roses.—*May 28.* A few potato bugs have just appeared, and plant lice are more abundant on cherrytrees than usual. Tent caterpillars do not appear to be as energetic as usual, possibly they were weakened by the early frost. Elm leaf beetles (Galerucella luteola Müll.) are very scarce, not a sign of one could be found on a large tree which had its foliage entirely destroyed two years ago.—*June 4.* Heavy rains have washed many of the aphids from the trees. Many plant lice continue on rosebushes that have not been sprayed.—*June 12.* The recent continued rains have prevented much damage from insect pests. Squash bugs (Anasa tristis DeGeer) are abundant enough to destroy the vines unless controlled. Some pear psylla (Psylla pyricola Forst.) has appeared on the trees in various pear orchards in this vicinity.—*June 18.* Pear psylla is injuring many trees and causing much of the fruit to drop. Plant lice are abundant on both young pear and apple trees.—*July 2*

Warren county [C. L. Williams, Glens Falls]—May beetles appeared in large numbers May 9. The asparagus beetle (Crioceris asparagi Linn.) was observed in considerable numbers May 16. It has become distributed over a tract at least 8 miles long and is abundant.—*May 25.* Rose beetles (Macrodactylus subspinosus Fabr.) appeared about June 22, and the depredations of a gray cutworm attracted attention about the same time. The former are very abundant and feed on all kinds of vegetation. The zebra caterpillar (Mamestra

picta Harr.) was found at work on strawberry plants.—*June 9.* June beetles are exceedingly abundant; more so than we have known for years.—*July 3.* The stalk borer (Papaipema nitela Guen.) is at work in small numbers on various plants, and we have succeeded in detecting a parasite on the same, which proves to be a tachinid.

Wayne county [C. H. Stuart, Newark]—The first aphids were observed on roses May 5, and comparatively few plants were infested. No tent caterpillars or cankerworms have been observed, and the spotted asparagus beetle (Crioceris 12-punctata Linn.) has disappeared, though the common species (C. asparagi Linn.) is present in force. House flies are scarce and occur only on the sunny side of buildings.—*May 19.* Plant lice began to appear the latter part of May, and have been more abundant than we have ever known them to be before. They oblige us to keep a gang of 15 or 20 men and boys at work continuously in the nursery with a whale oil soap solution to keep them in check. Larvae of lady beetles are more than usually abundant and are undoubtedly doing good service. On our lawn the only trees or plants that have escaped plant lice are poppies and evergreens; everything else is literally covered with them, or at least was so a week ago. Now the lady beetles are beginning to get the upper hand of the pests.—*July 2*

Westchester county [F. R. Calkins, Ossining]—Elm leaf beetles (Galerucella luteola Müll.) appeared May 3 and have been increasing rapidly but have caused no serious damage.—*May 4.* Bumble flower beetles (Euphoria inda Fabr.) were flying about in considerable numbers. Hundreds of them were observed, though there was no evidence of material injury. Grasshoppers were first seen May 6 and have become very numerous. Striped cucumber beetles (Diabrotica vittata Fabr.) appeared in large numbers on the 8th. The first Colorado potato beetles (Doryphora 10-lineata Say) were observed on the 15th. Appletree tent caterpillars (Malacosoma americana Fabr.) are causing a great deal of injury in this section, and species of plant lice are curling the leaves of various shrubs in this vicinity.—*May 18.* The majority of elms in this

section are in very bad condition owing to the work of the elm leaf beetle. Striped cucumber beetles continue very numerous, and potato beetles have appeared in the past week in increasing numbers. It looks as though the appletree tent caterpillars had been destroyed by some climatic condition; possibly the severe rains in May and June. Since we had 31 days of rain with hardly a ray of sunshine, the webs are empty and there are no signs of cocoons. Mosquitos are somewhat scarce. The work of the pear midge (Diplosis pyrivora Riley) is very evident, and cherry borers (probably the fruit tree bark beetles Scolytus rugulosus Ratz.), have ruined some trees.—*July 13*

Westchester county [Mrs Edwin H. Mairs, Irvington-on-Hudson]—White marked tussock moth caterpillars (Notolophus leucostigma Abb. & Sm.) are injuring the foliage of a fine purple beech, which is also suffering severely from plant lice, probably the woolly beech aphis (Phyllaphis fagi Linn.). Mapletrees have dropped many leaves, probably because of plant lice injury. Very likely this is the work of Chaitophorus aceris Thos.—*June 29.* A curious worm (Seirodonta bilineata Pack.) was found feeding on foliage of purple beech. Mosquitos are more abundant than ever. Elm leaf beetle larvae (Galerucella luteola Müll.) are crawling along the trunks of infested trees, the foliage of which is turning brown. American, English, weeping and slippery elms are all attacked. Maple and beech trees are still suffering from plant lice injury. Some red bugs are present on the infested trees.—*July 12*

Wyoming county [W. H. Roeper, Wyoming]—Appletree tent caterpillars (Malacosoma americana Fabr.) were first observed May 2. They are present in small numbers, and some think this is due to the excessively cold weather.—*May 9.* Insects of various kinds are much scarcer than usual.—*May 18.* Tent caterpillars are not causing much injury though canker-worms are working to some extent. The weather continues very cold at night, and it is exceedingly dry.—*May 25.* Codling moth larvae (Carpocapsa pomonella Schiff.) are unusually abundant in this locality, and apple aphis (Aphis mali Fabr.) is very numerous and rolling the leaves to a con-

siderable extent. The injury is so severe that it would not be surprising if a considerable proportion of the foliage dropped. Potato beetles (Doryphora 10-lineata Say) are present in large numbers. Plant lice are also working on forest trees in about the same way as on fruit trees. The weather continues very dry and appears to be favorable to plant lice. The apple crop will be only about one quarter its normal size, and pears are almost a failure. Plant lice continue to be the most destructive form in this section, and the injury is so severe that some trees have half their leaves badly curled by the pests. A good rain has benefited crops very much.—*June 15.* Maple foliage is dropping to a considerable extent, probably as a result of injury by plant lice (Drepanosiphum acerifolii Thos.)—*July 3*

LIST OF PUBLICATIONS OF THE ENTOMOLOGIST

The following is a list of the principal publications of the entomologist during the year 1903. 70 are given with the title,[1] place, time of publication and a summary of the contents of each. Volume and page number 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. 67:974[16] means volume 67, page 974, column 1, beginning in the sixth ninth, i.e. about two thirds of the way down.

Turnips. Country Gentleman, Nov. 27, 1902, 67:974[16]

The work of the cabbage root maggot, Phorbia brassicae Bouché, in turnips is identified and remedial measures discussed.

Experimental Work in New York State against the San José Scale [Aspidiotus perniciosus Comst.] U. S. Dep't Agric. Div. Ent. Bul. 37, n.s. 1902. p.35-36

Discussion of results obtained with 20% mechanical crude petroleum emulsion and whale oil soap.

Notes for the Year in New York. U. S. Dep't Agric. Div. Ent. Bul. 37, n.s. 1902. p.102-3

Brief records of injury by grapevine root worm, Fidia viticida Walsh; grapevine leaf hopper, Typhlocyba comes var. vitis Harr.;

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

appletree tent caterpillar, Clisiocampa [Malacosoma] americana Fabr.; forest tent caterpillar, Clisiocampa [Malacosoma] disstria Hübn. and fall webworm, Hyphantria cunea Drury [textor Harr.].

Observations on Certain Insects Attacking Pine Trees. U. S. Dep't Agric. Div. Ent. Bul. 37, n.s. 1902. p.103-4

Records of injuries by Tomicus calligraphus Germ., T. pini Say and also of Monohammus confusor Kirby and Dendroctonus terebrans Oliv.

Potato Wireworms. Country Gentleman, Dec. 4, 1902, 57:992[13]

General remedial measures for wireworms are briefly discussed.

Crude Petroleum as an Insecticide. Soc. Promotion Agric. Sci. Proc. 23d An. Meeting 1902, p.86-95; separate p.1-10 received Dec. 24, 1902

A review of experiments with crude petroleum and summary of results in controlling San José scale, Aspidiotus perniciosus Comst.

Maggots in Mushrooms. Country Gentleman, Jan. 1, 1903, 68:6[15]

Brief account of species injuring mushrooms and remedies therefor, Phora agarici Lint. and species of Sciara being mentioned in particular.

Entomology. U. S. N. Y. Handbook 16, revised Dec. 1902, p.1-12, issued Jan. 3, 1903

Contents

	PAGE		PAGE
Definition	1	Lectures	7
Systematic entomology	1	Voluntary observers	7
Economic entomology	2	Publications	8
History of the division	3	Educational work	9
Investigations	4	List of entomologic publications	10
Collections	5		

Grapevine Root Worm [Fidia viticida Walsh]. N. Y. State Mus. Bul. 59. 1902. p.49-84, 1 col.pl. 4 halftones

Issued Jan. 5, 1903. Republished in great part in issues of *Grape Belt* [Dunkirk N. Y.] for Jan. 9, 13, 20, 27, Feb. 3, 10.

Contents

	PAGE		PAGE
Preface	49	Description	58
Introduction	51	Life history	60
Area infested	51	Habits of the beetle	61
Signs of insect's presence	52	Eggs	63
A native species	53	Habits of the larvae	66
Allies	54	Pupa	68
Present conditions in Ohio	54	Food plants	68
Early history	57	Natural enemies	69

PAGE

Remedial measures..... 69
Destroying the pupae..... 70
Collecting beetles..... 71
Arsenical poisons..... 73
Pulverizing the soil and mounding 76
Carbon bisulfid..... 76
Kerosene emulsion..... 77
Crude petroleum..... 77
Calcium carbid..... 77
Recommendations 78
Bibliography 78
Explanation of plates..... 81
Plates 1-6.....face 81
Index 82

Cucumber Beetle. Country Gentleman, Jan. 15, 1903, 68:43[24]

Remedial measures for the striped cucumber beetle, Diabrotica vittata Fabr.

Insecticides and Notes. Country Gentleman, Jan. 15, 1903, 68:47[35]

Summary of results obtained with insecticides against San José scale, Aspidiotus perniciosus Comst., and notes on the Chinese ladybug, Chilocorus similis Rossi, and the grapevine root worm, Fidia viticida Walsh.

Beware the Pea Weevil. Country Gentleman, Jan. 22, 1903, 68:63[42]

Injuries by Bruchus pisorum Linn. in Canada and means of controlling.

Legislation against Pests. Country Gentleman, Jan. 29, 1903, 68:89[25]

General discussion of the efficacy of nursery inspection work with comments on present conditions.

The San José Scale. Country Gentleman, Feb. 19, 1903, 68:158[11]

Comparative value of crude petroleum emulsion, lime, salt and sulfur mixture and whale oil soap for Aspidiotus perniciosus Comst.

Beneficial Insects. Country Gentleman, Mar. 5, 1903, 68:206[33]

General observations on the establishment of Scutellista cyanea Motsch, Novius cardinalis Mask. and Chilocorus similis Rossi in the United States.

Scale Insects. Worcester [Mass.] Evening Gazette, Mar. 12, 1903, p.1

Summary notice of scale insects with special reference to remedies for the San José scale, Aspidiotus perniciosus Comst.

Arsenate of Lead. Country Gentleman, Mar. 19, 1903, 68:252[17]

Formula and method of preparation.

Looper Caterpillar. Country Gentleman, Mar. 19, 1903, 68:252[23]

Description too brief to permit identification of the geometrid.

Grapevine Root Worm. Country Gentleman, Mar. 19, 1903, 68:255[34]

Corrects reported error and gives estimates of damage by Fidia viticida Walsh.

Recent Work with Insecticides in the East. Col. State Bd Hort. Rep't 1902. 1903. p.121-27

Brief discussion of the value of arsenate of lead, crude petroleum, the lime, salt and sulfur mixture and whale oil soap as insecticides.

Fleas. Country Gentleman, Mar. 26, 1903, 68:276[16]

Brief account of life history with various repressive measures.

Appletree Bark Louse. Country Gentleman, Mar. 26, 1903, 68:276[24]

Remedial measures for Mytilaspis pomorum Bouché [Lepidosaphes ulmi Linn.].

Insecticides and Fungicides. U. S. N. Y. Handbook 18, p.16

More important formulas recommended with general directions for use.

Pea Weevil. Country Gentleman, Ap. 2, 1903, 68:293[24]

Discussion of rise in temperature in peas infested with Bruchus pisorum Linn. and methods of controlling the pest.

San José Scale. Country Gentleman, Ap. 2, 1903, 68:300[12]

No danger of Aspidiotus perniciosus Comst. spreading from infested wood cut in early spring.

Elm Leaf Beetle. Schenectady Daily Union, Ap. 3, 1903, p.7

Nearly the same in Evening Star [Schenectady] Ap. 3, p.12.

Extracts from Museum Bulletin 57 on Galerucella luteola Müll., with special reference to local conditions.

Shade Tree Ratings. Street forestry report on the selection, planting, cultivation and care of street shade trees by Frederic Shonnard, Dep't Public Works, Yonkers, 1903

Ratings of comparative immunity from insect enemies of various shade trees.

Dust and Other Sprays. Country Gentleman, Ap. 16, 1903, 68:350[23]

Brief discussion of various insecticides with special reference to scale insects and dry or dust sprays.

Advice about Spraying. Country Gentleman, Ap. 30, 1903, 68:392[23]

General directions for spraying with references to convenient literature.

Arsenate of Lead. Country Gentleman, May 7, 1903, 68:410[35]

Its preparation from arsenic, soda and sugar of lead not advisable. Directions are given for making it.

Literature of American Economic Entomology. Am. Ass'n Eco. Ent. 15th An. Meeting, Presidential address, Washington D. C. Dec. 26, 1902. U. S. Dep't Agric. Div. Ent. Bul. 40, n.s. 1903. p.7-22

Also published separately.

After a general review with a few statistics regarding the amount of literature relating to some of the more notorious insects, the following topics were discussed: Newspaper and Minor Articles; Reports; Bulletins; Journals; General Works and Indexes.

Work and Observations in 1902. N. Y. State Fruit Growers Ass'n Rep't 1903, p.92-94. Rec'd May 15

Results obtained with crude petroleum, whale oil soap and lime, salt and sulfur against San José scale, Aspidiotus perniciosus Comst. Notes on the establishment of Chilocorus similis Rossi and work of grapevine root worm, Fidia viticida Walsh.

Elm Leaf Beetle Ravages. Argus [Albany] May 16, 1903; New York Times, May 17; Rensselaer County Standard [Hoosick Falls] May 22, 1903, p.4

Summary of injuries by Galerucella luteola Müll. in Hudson river valley.

New York Entomologic Service. Country Gentleman, May 21, 1903, 68:451[36]

Summary of reports from voluntary observers.

Diseases and Pests. N. Y. State Lib. Bul. 80. Review of Legislation 1902, p.837-38

Summary of recent laws relating to plant diseases and insect enemies.

Importance of Injurious Insects Introduced from Abroad. Soc. Promotion Agric. Sci. Proc. 24th An. Meeting 1903, p.39-48; separate, p.1-10

Summarized account of injuries with classified lists of introduced species and notes on the relative importance of various species.

New York Entomologic Service. Country Gentleman, May 28, 1903, 68:471[33]

Summaries of reports from voluntary observers.

18th Report of the State Entomologist on Injurious and Other Insects of the State of New York 1902. N. Y. State Mus. Bul. 64. 1903. p.89-193, 1 lith. 5 halftones

Issued June 2.

Contents

	PAGE
Introduction	89
General entomologic features.	89
Office work	90
Special investigations	91
Publications	91
Collections of insects	92
New quarters	93
Voluntary observers	93
Acknowledgments	93
Injurious insects	
Euproctis chrysorrhoea, brown tail moth	94
Psila rosae, carrot rust fly	99
Notes for the year	103
Fruit tree pests	104
Small fruit insects	105
Grass and grain insects	106
Shade tree insects	108
Forest insects	110
Household insects	113
Beneficial insects	114
Injurious insects from abroad	116
Injurious insects, etc. (*continued*)	PAGE
Species of primary economic importance	120
Species which may become very destructive	122
Other species	122
Experimental work against San José scale insect	126
Fall applications	126
Spring applications	131
Summary	143
Voluntary entomologic service	144
Summaries of reports	144
Faunal studies	153
Coleoptera taken at Newport, Herkimer co. N.Y.	153
List of publications of the entomologist	161
Contributions to collection	170
Explanation of plates	178
Plates 1-6	face 179
Index	181

New York Entomologic Service. Country Gentleman, June 4, 1903, 68:498[14]

Summary of reports from voluntary observers.

Remedies for Grapevine Root Worms. Grape Belt, June 16, 1903, p.2

Brief statement of remedial measures for Fidia viticida Walsh.

New York Entomologic Service. Country Gentleman, June 18, 1903, 68:530[38]

Summary of reports from voluntary observers.

Hints to Fruit Growers and Truckers. Am. Agric. June 20, 1903, 71:648[24]

Briefly discusses the grapevine root worm, Fidia viticida Walsh, injuries in Chautauqua grape belt and remedies for same, and also the plum curculio, asparagus beetles, and insect enemies of squash.

New York Entomologic Service. Country Gentleman, June 25, 1903, 68:551[12]

Summary of reports from voluntary observers.

Destroying Flies. Country Gentleman, June 25, 1903, 68:561[21]

Destructive and preventive measures for the house fly, Musca domestica Linn.

Grapevine Root Worm. Grape Belt, June 26, 1903, p.1, 6

Beetles attack best vineyards, no decided migration, figures on efficacy of destroying pupae and remarks on value of beetle catchers and arsenical poisons for Fidia viticida Walsh.

Mosquitos. N. Y. State Mus. folder. 8p.

Issued June 29, 1903.

Brief description with discussion of habits, life history, genera and species, methods of controlling and collecting.

Grapevine Root Worm. Grape Belt, June 30, 1903, p.4

Results of breeding from entire vines and efficiency of beetle catchers for Fidia viticida Walsh.

New York Entomologic Service. Country Gentleman, July 2, 1903, 68:578[33]

Summary of reports from voluntary observers.

Plant Lice. Country Gentleman, July 9, 1903, 68:590[27]

Remedial measures for plant lice on fruit trees.

Killing Ants. Country Gentleman, July 9, 1903, 68:590[32]

Method of destroying ants in nests.

Rose Beetles. Country Gentleman, July 9, 1903, 68:590[34]

Methods of destroying the beetles, Macrodactylus subspinosus Fabr.

New York Entomologic Service. Country Gentleman, July 9, 1903, 68:590[45]

Summary of reports from voluntary observers.

About Maple Tree Borers. Rome Daily Sentinel, July 10, 1903

Methods of controlling the sugar maple borer, Plagionotus speciosus Say.

Plant Lice. Country Gentleman, July 16, 1903, 68:610[27]

Comments on unusual abundance of plant lice and remedies for the same.

New York Entomologic Service. Country Gentleman, July 16, 1903, 68:610[47]

Summary of reports from voluntary observers.

Mosquitos. Sunday [Albany] Press, July 19, 1903, p.6

Reprint of portions of mosquito folder.

Spray for Potatoes. Country Gentleman, July 23, 1903, 68:630[17]

Advises arsenate of lead for potato beetles and bordeaux mixture for fungus.

New York Entomologic Service. Country Gentleman, July 23, 1903, 68:630[43]

Summary of reports from voluntary observers.

Plant Lice. Country Gentleman, July 30, 1903, 68:650[34]

Remedies for the pests.

New York Entomologic Service. Country Gentleman, July 30, 1903, 60:650[45]

Summary of reports from voluntary observers.

Forest Fires and Insect Attack. Am. Lumberman, Aug. 8, 1903, p.15

Preliminary report on investigations in burned areas in the Adirondacks.

Aquatic Nematocerous Diptera by Oskar Augustus Johannsen. Reprint from N. Y. State Mus. Bul. 68. 1903. p.328-441

Issued Aug. 11, 1903.

This paper includes a key to families of nematocerous diptera with accounts of the net-winged midges (Blepharoceridae), black flies (Simuliidae) and mosquitos (Culicidae).

Tulip Tree Scale. Country Gentleman, Aug. 20, 1903, 68:712[25]

Brief notice with remedies for Lecanium [Eulecanium] tuliperae Cook.

Summary of Root Worm Situation and Experiments. Grape Belt, Sep. 4, 1903, p.1; Jamestown Journal, Sep. 4, 1903, p.1; Country Gentleman, Sep. 24, 1903, 68:828[27]

Brief summary of observations and experimental work on Fidia viticida Walsh in 1903.

Mosquitos on High Ground. Country Gentleman, Sep. 10, 1903, 68:781[24]

Brief comments on the breeding habits and methods of controlling these insects.

Aquatic Chrysomelidae and a Table of the Families of Coleopterous Larvae by Alex. D. MacGillivray. Reprint from N. Y. State Mus. Bul. 68. 1903. p.288-331

Issued Sep. 12, 1903.

This paper includes a key to families of coleopterous larvae and a monograph of the subfamily Donaciinae, family Chrysomelidae.

Aquatic Insects of New York State. N. Y. State Mus. Bul. 68. 1903. p.199-517, 52 pl. (3 col.) by James G. Needham Ph.D., professor of biology, Lake Forest Univ.; A. D. MacGillivray Ph.D., instructor in entomology, O. A. Johannsen M.S., instructor in civil engineering, both of Cornell Univ.; and K. C. Davis Ph.D., professor of horticulture, West Virginia Univ.

Issued Sep. 28, 1903.

Contents

	PAGE
Preface	199
Part 1 Station Work of the Summer of 1901. J. G. NEEDHAM	200
Part 2 Food of Brook Trout in Bone Pond. J. G. NEEDHAM	204
Part 3 Life Histories of Odonata suborder Zygoptera. J. G. NEEDHAM	218
Part 4 Some New Life Histories of Diptera. J. G. NEEDHAM	279
Part 5 Aquatic Chrysomelidae and a Table of the Families of Coleopterous Larvae. A. D. MACGILLIVRAY	288
Part 6 Aquatic Nematocerous Diptera. O. A. JOHANNSEN	328
Part 7 Sialididae of North and South America. K. C. DAVIS.	442
Explanation of plates	487
List of text figures	499
Plates 1-52	face 499
Index	501

Sialididae of North and South America by K. C. Davis. Reprint from N. Y. State Mus. Bul. 68. 1903. p.441-87

Issued Sep. 30, 1903.

A systematic and biologic account of this group.

Two Tree Pests. Country Gentleman, Oct. 1, 1903, 68:852[43]

Pear psylla, Psylla pyricola Forst. probably weakened the pear trees at Hartley Hall Pa., so that they were attacked by the fruit tree bark beetle, Scolytus rugulosus Ratz. Destruction of the infested trees by fire is advisable. The maple is probably infested by Sesia acerni Clem. Preventive measures are indicated.

Chinese Lady Bugs. Country Gentleman, Oct. 8, 1903, 68:871[18]

Records establishment and breeding of Chilocorus similis Rossi at Kinderhook N. Y.

INSECT EXCHANGE

The state collection of insects contains large numbers of many local, and in some cases somewhat rare forms. This, in connection with the fact that many species are not represented, and specially in view of the economic importance of introduced insects, led us to inaugurate a system of exchanges the past summer. Those offered for exchange are, in every case, only such as can be

spared without detriment to the general collections, and in return it has been our desire to obtain, so far as possible, species of economic importance in other sections of this country or any other countries, specially those which might develop into injurious pests. A preliminary exchange list was sent out in the early summer, and the results have been very gratifying, since we have been able by this means, to make a number of extremely valuable additions to the state collections. This is specially true in the case of Coccidae, and was largely possible through the kindness of Prof. V. L. Kellogg of Leland Stanford Jr University, who was able to offer us some extremely desirable Californian and Japanese scale insects in exchange for some of our native forms. Another very desirable exchange was arranged with Prof. F. H. Snow of Kansas University, who sent valuable Diptera and some cotypes, all determined by the noted authority in this group, Dr S. W. Williston. The species, 418 in number, acquired in this manner are listed below.

SPECIES RECEIVED IN EXCHANGE

The source of various species listed below, is indicated by superior figures following the author of the species, as follows:

1, from Prof. C. P. Gillette, Agricultural College, Fort Collins Col.; 2, from Prof. V. L. Kellogg, Leland Stanford Jr University, California; 3, from E. M. Ehrhorn, Mountain View Cal.; 4, from Prof. F. H. Snow, University of Kansas, Lawrence Kan.; 5, from Prof. E. A. Popenoe, state entomologist, Topeka Kan.; 6, from Prof. H. Garman, Agricultural Experiment Station, Lexington Ky.; 7, from J. G. Sanders, 8, from Prof. Herbert Osborn, both of the Ohio State University, Columbus O.

Hymenoptera

Bombus separatus *Cress.*[1]
B. sylvicola *Kirby*[1]
B. putnami *Cress.*[1]
B. proximus *Cress.*[1]
B. nevadensis *Cress.*[1]
B. morrisonii *Cress.*[1]
B. mixtus *Cress.*[1]
B. juxtus *Cress.*[1]
B. flavifrons *Cress.*[1]
B. bifarius *Cress.*[1]
B. appositus *Cress.*[1]
Psithyrus insularis *Cress.*[1]
Anthopora vallorum *Ckll.*[1]
A. urbana *Cress.*[1]
A. smithii *Cress.*[1]
A. occidentalis *Cress.*[1]
Synhalonia frater *Cress.*[1]
Melissodes obliqua *Say*[1]

Diadasia australis *Cress.*[1]
D. diminuta *Cress.*[1]
Megachile montivaga *Cress.*[1]
M. fidelis *Cress.*[1]
Lithurgus apicalis *Cress.*[1]
Anthidium maculifrons *Smith*[1]
A. interruptum *Say*[1]
Coelioxys gilensis *Ckill.*[1]
Augochlora coloradensis *Titus*[1]
Epeolus robustus *Cress.*[1]
E. occidentalis *Cress.*[1]
E. concavus *Cress.*[1]
E. compactus *Cress.*[1]
Nomada ridingsii *Cress.*[1]
Vespa occidentalis *Cress.*[1]
Polybia flavitarsis *Sauss.*[1]
Odynerus taos *Cress.*[1]
O. foraminatus *Sauss.*[1]
Crabro 6-maculatus *Say*[1]
Philanthus flavifrons *Cress.*[1]
Eucerceris fulvipes *Cress.*[1]

Coleoptera

Hylastes longus *Lec.*[4]
Scolytus 4-dentatus *Say*[5]
Pityogenes pondrosae *Hopk.*[1]
Tomicus integer *Eich.*[1]
Calandra oryzae *Linn.*[6]
Baris strenua *Lec.*[5]
Thysanocnemis helvolus *Lec.*[5]
T. fraxini *Lec.*[5]
Anthonomus squamosus *Lec.*[1]
Tachypterus 4-gibbus *Say*[5]
Lixus macer *Lec.*[5]
Rhynchites hirtus *Fabr.*[5]
Epicauta corvina *Lec.*[5]
Crymodes discicollis *Lec.*[1]
C. exiguus[5]
Bruchus fraterculus *Horn*[1]
B. discoideus *Say*[5]
B. 4-maculatus *Fabr.*[5]
B. mimus *Say*[1]
Spermophagus robiniae *Sch.*[1]
Chelymorpha phytophagica *Cr.*[5]
Cassida pallidula *Boh.*[5]
C. ellipsis *Lec.*[5]
Diabrotica lemniscata *Lec.*[4]
Monocesta coryli *Say*[4]
Lina lapponica *Linn.*[6]
Colaspis favosa *Say*[4]
Paria viridicyanea *Cr.*[4]
Myochrous denticollis *Say*[4]
Fidia longipes *Melsh*[4]
Exema conspersa *Mann.*[4]
E. dispar *Lec.*[5]
Saxinis omogera *Lac.*[4]
Babia 4-guttata *Oliv.*[4]
Coscinoptera dominicana *Fabr.*[4]
C. axillaris *Lec.*[4]
Tetraopes canescens *Lec.*[1]
T. femoratus *Lec.*[1]
Dectes spinosus *Say*[4]
Plectrodera scalator *Fabr.*[1]
Dorcaschema alternatum *Say*[5]
D. wildii *Uhler*[5]
Monohammus oregonensis *Lec.*[1]
Monilema annulatum *Say*[5]
Leptura chrysocoma *Kirby*[1]
Typocerus sinuatus *Newm.*[5]
Neoclytus muricatulus *Kirby*[4]
Cyllene decorus *Oliv.*[4]
Tragidion fulvipenne *Say*[4]
Rhopalophora longipes *Say*[4]
Eburia 4-geminata *Say*[6]
Callidium janthinum *Lec.*[1]
Prionus imbricornis *Linn.*[5]
Euphoria kernii *Hald.*[5]
E. kernii *var.*[5]
E. kernii *black var.*[5]
E. areata *Fabr.*[5]
Dynastes tityus *Linn.*[6]
Strigoderma arboricola *Fabr.*[5]
Polyphylla decemlineata *Say*[1]
Bolboceras farctus *Fabr.*[6]
Phanaeus palliatus[1]
Canthon praticola *Lec.*[5]
Hydnocera tabida *Lec.*[4]
H. subfasciata *Lec.*[1]
Clerus sphegeus *Fabr.*[4]
C. nigriventris *Lec.*[4]
C. ichneumoneus *Fabr.*[5]
C. spinolae *Lec.*[5]
Acmaeodera pulchella *Herbst.*[1]
Psiloptera drummondi *Lap. & Gory.*[5]
Gyascutus obliteratus *Lec.*[1]
Limonius canus *Lec.*[1]
Elater apicatus *Say*[1]
Crytohypnus pectoralis *Say*
Plegaderus nitidus *Horn*[1]
Hister instratus *Lec.*[1]
Orphilus niger *Rossi*[1]

Dermestes fasciatus *Lec.*[1]
Silvanus planatus *Germ.*[1]
Languria laeta *Lec.*[1]
Hyperaspis lateralis *Muls.*[1]
Brachyacantha dentipes *Fabr.*[4]
Exochomus contristatus *Muls.*[4]
E. aethiops *Bland.*[1]
Coccinella abdominalis *Say*[4]
C. annectans *Cr.*[1]
C. monticola *Muls.*[4]
C. transversoguttata *Fabr.*[1]
Hippodamia sinuata *Muls.*[1]
Olibrus vittatus *Lec.*[1]
Homalium humerosum *Fauv.*[1]
Homalota lividipennis *Mann.*[1]
Dineutes assimilis *Aube.*[5]
Nothopus zabroides *Lec.*[1]
Cymindis planipennis *Lec.*[1]
Lebia atriceps *Lec.*[1]
Anophthalmus horni *Garman*[6]
Tetracha virginica *Linn.*[6]

Diptera

Cistogaster immaculata *Macq.*[4]
Gymnosoma fuliginosa *Desv.*[4]
Xanthomelana arcuata *Say*[4]
Hemyda aurata *Desv.*[4]
Epigrimyia lucens *Town.*[4]
Belvoisia bifasciata *Fabr.*[4]
B. unifasciata *Desv.*[4]
Ocyptera carolinae *Desv.*[4]
O. dosiades *Walk.*[4]
Linnaemyia comta *Fall.*[4]
Blepharipeza adusta *Loew.*[4]
Hilarella polita *Town.*[4]
Gonia capitata *DeG.*[4]
Spallanzania hebes *Fall.*[4]
S. hesperidarum *Will.*[4]
Tricophora ruficauda *v.d. W.*[4]
Peleteria robusta *Wied.*[4]
Archytas analis *Fabr.*[4]
A. aterrima *Desv.*[4]
A. hystrix *Wied.*[4]
A. lateralis *Macq.*[4]
Echinomyia algens *Wied.*[4]
E. decisa *Walk.*[4]
E. hystricosa *Will.*[4]
Epalpus bicolor *Will.*[4]
E. signifera *Will.*[4]
Bombyliomyia abrupta *Wied.*[4]
Dejeania vexatrix *O. S.*[4]
Paradejeania rutilioides *Jaen.*[4]
Jurinella ambigua *Macq.*[4]
Syrphus arcutatus *Fall.*[8]
S. umbellatarum *Schiner* [8]
Mesograpta marginata *Say*[8]
M. polita *Say*[8]
Rhingia nasica *Say*[8]
Heliophilus laetus *Loew.*[8]
Tropidia quadrata *Say*[8]
Spilomyia longicornis *Loew.*[8]
Chrysops callidus *O. S.*[4]
C. plangens *Wied.*[4]
Tabanus rhombicus *O. S.*[4]

LIST OF CULICIDAE FROM PROF. F. V. THEOBALD, ENGLAND

Myzomyia rossi *Giles;* India
Pyretophorus costalis *Loew;* West Africa
Myzorhynchus barbirostris *v. d. Wulp.;* Malay states
M. nigerrimus *Giles;* India
M. sinensis *Wied.;* Malay states
Nyssorhynchus fuliginosus *Giles;* India
N. jamesii *Theob.;* India
N. maculata *Theob.;* India
N. masteri *Skuse;* Australia
Cellia argyrotarsis *Desv.;* South Lucia
C. albipes *Theob.;* New Amsterdam
Janthinosoma lutzii *Theob.;* Rio de Janeiro
J. musica *Say;* Rio and New Amsterdam
Mucidus alternans *Westw.;* Australia
Eretmapodites quinquevittata *Theob.;* Uganda
Desvoidea obturbans *Walk.;* India
D. panalectros *Giles;* India
Stegomyia fasciata *Fabr.*
S. scutellaris *Walk.;* Malay states
Scutomyia (Stegomyia) notoscripta *Skuse;* Australia and India
Theobaldia annulata *Meig.;* England

T. incidens *Thomson;* North America
T. spathipalpis *Rondani;* Madeira
Culex alboannulatus *Macq.;* Australia
C. annulioris *Theob.;* Transvaal
C. annulirostris *Skuse;* Australia and New Guinea
C. canadensis *Theob.;* Canada
C. cantans *Meig.;* Canada
C. concolor *Desv.;* India
C. confirmatus *Arrib.;* Rio de Janeiro
C. cylindricus *Theob.;* Australia
C. diversus *Theob.;* Europe
C. fatigans *Wied.*
C. gelidus *Theob.;* Malay states
C. luteolateralis *Theob.;* west and central Africa
C. mimeticus *Noè;* India and Malay states
C. occidentalis *Skuse;* Australia
C. ochraceus *Theob.;* central Africa
C. pulcriventer *Giles;* India
C. sylvestris *Theob.;* Canada
C. taeniorhynchus *Wied.;* Rio de Janeiro
C. tigripes *Grandpré;* Mauritus
C. viridiventer *Giles;* India
C. vittiger *Skuse;* Australia
Melaniconion atratus *Theob.;* Jamaica
Grabhamia pygmaeus *Theob.;* West Indies
G. vittata *Theob.;* New Mexico
Taeniorhynchus aurifer *Theob.;* Uganda
T. brevicellulus *Theob.;* Malay states
T. conopas *Frau.;* Malay states
T. fasciolatus *Arrib.;* British Guiana
T. fulvus *Wied.;* Para
Mansonia annulifera *Theob.;* India
M. annulipes *Walk.;* Malay states
M. titillans *Walk.;* British Guiana
M. uniformis *Theob.;* Malay states and Africa
Deinocerites cancer *Theob.;* West Indies and Uganda
Uranotaenia socialis *Theob.;* West Indies
Aedeomyia squammipenna *Arrib.;* Malay states
Phoniomyia longirostris *Theob.;* Trinidad
Sabethes remipes *Wied.;* Brazil
Limatus durhamii *Theob.;* para
Trichoprosopon (Joblotia) nivipes *Theob.;* Trinidad

Lepidoptera

Anaea andria *Scud.*[6]
Ceratomia catalpae *Bdv.*[6]
Eubaphe rubicundaria *Hübn.*[1]
Arachnis picta, *Pack.*[1]
Apantesis incorrupta *Hy. Edw.*[1]
Parasemia plantaginis *Linn.*[1]
Laphygma frugiperda *Sm. & Abb.*[6]
Oncocnemis augustus *Harv.*[1]
Heliothis armiger *Hübn.*[6]
Autographa brassicae *Riley*[6]
Syneda howlandii *Grote*[1]
Homoptera rubi *Hy. Edw.*[1]
Nycteola proteella *Dyar*[1]
Hydriomena *sp.*[1]
Triprocris smithsonianus *Clem.*[1]
Loxostege sticticalis *Linn.*[1]
L. commixtalis *Walk.*[1]
L. coloradensis *Gr. Rob.*[1]
Cornifrons simalis *Grote*[1]
Crambus teterrellus *Zinck.*[1]
Thaumatopsis repanda *Grote*[1]
Hulstea undulatella *Clem.*[1]
Homoeosoma electellum *Hulst.*[1]
Ethmia discostrigella *Chamb.*[1]

Neuroptera

Raphidia oblita *Hag.*[1]
Chrysopa externa *Hag.*[1]
Brachynemurus nigrilabris *Hag.*[1]
Platyphylax designata *Walk.*[1]

Hemiptera

Homaloporus congruus *Uhl.*[1]
Perillus claudus *Say*[1]
Apateticus marginiventris *Stal.*[1]
Cosmopepla conspicillaris *Dallas*[1]
Carpocoris lynx *Fabr.*[1]
Thyanta custator *Fabr.*[1]
T. rugulosa *Say*[1]
Archimerus calcarator *Fabr.*[1]
Catorhintha guttula *Fabr.*[1]
Ficana apicalis *Dallas*[1]
Alydus quinquespinosus *Say*[1]
A. pluto *Uhl.*[1]
Darmistus subvittatus *Stal.*[1]
Scolopocerus secundarius *Uhl.*[1]
Nysius minutus *Uhl.*[1]
Orsillus scolopax *Say*[1]
Ischnodemus falicus *Say*[1]
Geocoris pallens *Stal.*[1]
Heraeus insignis *Uhl.*[1]
Pamera bilobata *Say*[1]
Trapezonotus nebulosus *Fall.*[1]
Emblethis arenarius *Linn.*[1]
Rhyparochromus floralis *Uhl.*[1]
Melanocoryphus bicrucis *Say*[1]
M. facetus *Say*[1]
M. admirabilis *Uhl.*[1]
Lygaeus reclivatus *Say*[1]
Largus cinctus *H. Sch.*[1]
Dysdercus mimus *Say*[1]
D. albidiventris *Stal.*[1]
Trigonotylus pulcher *Reut.*[1]
Callimiris tarsalis *Reut.*[1]
Resthenia insignis *Say*[1]
Lomatopleura caesar *Reut.*[1]
Hadronema militaris *Uhl.*[1]
Poeciloscytus[1]
Systratiotus americanus *Reut.*[1]
Camptobrochis nebulosus *Uhl.*[1]
Capsus brachycorus *Uhl.*[1]
Pycnoderes 4-maculatus *Guer.*[1]
Labops hesperius *Uhl.*[1]
Dicyphus californicus *Stal.*[1]
Orectoderus[1]
Anthocoris melanocerus *Reut.*[1]
Coriscus kalmii *Reut.*[1]
Repipta taurus *Fabr.*[1]
Apiomerus pictipes *H. Sch.*[1]
A. ventralis *Say*[1]
Hygrotrechus remigis *Say*[1]
Limnotrechus marginatus *Say*[1]
Hebrus concinnus *Uhl.*[1]
Cicada *var.* cassinii *Fish.*[6]
Microvelia[1]
M. hornii *Uhl.*[1]
Salda interstitialis *Say*[1]
S. pallipes *Fabr.*[1]
Galgulus oculatus *Fabr.*[1]
Anisops platycnemis *Fieb.*[1]
Corisa abdominalis *Say*[1]

Coccidae

Parlatoria pergandii *Comst.*[2] on Japanese orange; Stanford University Cal.
P. fiorinia[2]; Gifu-Ken, Japan
Lepidosaphes ulmi *Linn.*[2] on apple; Stanford University Cal.
L. newsteadi tokionis *Kuw.*[2] on Codiaeum; Tokyo, Japan
L. gloverii *Pack.*[2] on orange; Kiushiu, Japan
L. crawii *Ckll.*[2] Angio Saitama-Ken, Japan
Odonaspis secreta *Ckll.*[2] on bamboo; Hikosan, Kiushiu, Japan
Chrysomphalus rossi *Mask.*[2] on Araucaria bidwillii; Stanford University Cal.
C. obscurus *Comst.*[7] on Quercus coccinea; Columbus O.
C. kelloggi *Kuw.*[2] Chikujo-gun, Kiushiu, Japan
C. aurantii citrinus *Coq.*[2] Mazatlan, Mexico
C. aonidum *Linn.*[2] on fern; Tokyo, Japan
Pseudaonidia paeoniae *Ckll.*[2] on Aoskia; Hikosan, Kiushiu, Japan
Aspidiotus rapax *Comst.*[2,3] on laurel; Stanford University Cal.
A. perniciosus *Comst.*[2] on peach; Stanford University Cal.
A. lataniae *Sign.*[2] Tokyo, Japan
A. hederae *Vall.*[2] on Sequoia sempervirens; Stanford University Cal.

A. glanduliferus *Ckll.*[7] on Pinus sylvestris; Columbus O.

A. coniferarum shastae *Cole*[2] on cypress; Lake co. Cal.

A. californicus *Cole*[2] on Pinus ponderosa; Cobb Mt, Lake co. Cal.

A. aesculi *Johns.*[2] on buckeye; San Mateo Cal.

Leucaspis kelloggi *Cole*[2] on Abies concolor; Mt Shasta Cal.

Poliaspis pini *Mask.*[2] on Abies firma; Tokyo, Japan

Aulacaspis rosae *Bouché*[2] on wild rose; Palo Alto Cal.

A. pentagona *Targ.*[2] on cherry, plum; Tokyo, Japan

A. crawii *Ckll.*[2] on Yumi; Tokyo, Japan

Epidiaspis pyricola *Del Guer.*[3] on prune; Miliken, Santa Clara co. Cal.

Diaspis bromeliae *Kern.*[2] on palm; San José Cal.

Chionaspis spartinae *Comst.*[2] on Spartina stricta; Palo Alto Cal.

C. salicis-nigrae *Walsh*[7] on Salix cordata; Columbus O.

C. quercus *Comst.*[3] on Quercus chrysolepis; Stevens creek, Mountain View Cal.

C. pinifoliae *Fitch*[3] on Torreya californica; Stevens creek, Mountain View Cal.

C. ortholobis *Comst.*[3] on dogwood; Mountain View Cal.

C. gleditsiae *Sand.*[7] on Gleditsia tricanthos; Columbus O.

C. americana *Johns.*[7] on Ulmus americana; Columbus O.

Aclerda tokionis *Ckll.*[2]; Tokyo, Japan

A. californica *Ehrh.*[2] on bunch grass; Mountain View Cal.

Physokermes insignicola *Craw.*[2] on Pinus radiata; San Mateo Cal.

Saissetia oleae *Bern.*[2,3] on vine; San Mateo Cal.

Eulecanium quercitronis kermoides *Tyr.*[3] on Quercus agrifolia; Mountain View Cal.

E. armeniacum *Craw.*[2] on prune; Stanford University Cal.

E. adenostomae *Kuw.*[2] on Adenostoma fasciculatum; Black Mt Cal.

Coccus hesperidium *Linn.*[2,3] on rose; Arcada Cal.

Eucalymnatus tessellatus *Sign.*[2] on fern; San Francisco Cal.

Ceroplastes ceriferus *And.*[2] on tea

Pulvinaria rhois *Ehrh.*[3] on Rhus diversiloba; near Mountain View Cal.

P. aurantii *Ckll.*[2] on tea; Kokura, Kiushiu, Japan

Pseudococcus pseudonipae *Ckll.*[2] on palm; San Francisco Cal.

Phenacoccus dubia[2] on Diospyros kaki; Kusatsu, Shiga-Ken, Japan

Dactylopius dudleyi *Cole.*[2] on Cupressus macnabiona; Shasta Cal.

D. sp. *Coq.*[2] on cypress; Del Monte Cal.

Eriococcus graminis *Mask.*[2] on bamboo; Gifu-Ken, Japan.

E. artemisiae *Kuw.*[3] on Artemesia californica; Santa Clara county Cal.

E. araucariae *Mask.*[2] on Araucaria excelsa; Berkley Cal.

E. adenostomae *Ehrh.*[2] on Adnostoma fasciculatum; Black Mt Cal.

Gossyparia spuria *Modeer.*[2] on elm; Stanford University Cal.

Cerococcus quercus *Comst.*[2] on oak; Mountain View Cal.

C. ehrhorni *Ckll.*[2,3] on live oak; Mountain View Cal.

Lecaniodiaspis quercus *Ckll.*[2] on oak

Asterolecanium quercicola *Bouché*[2] on Quercus lobata, Stanford University Cal.

Icerya purchasi *Mask.*[2] on Scotch broom; Stanford University Cal.

Orthoptera

Hypochlora alba *Dodge*[1]
Campylacantha olivacae *Scud.*[1]
Hesperottetix viridis *Thos.*[1]
H. pratensis *Scud.*[1]
H. speciosus *Scud.*[1]
Aeoloplus regalis *Dodge*[1]
Podisma dodgei *Thos.*[1]
Melanoplus lakinus *Scud.*[1]
M. differentialis *Thos.*[6]
M. flabellifer *Scud.*[1]
M. bowditchi *Scud.*[1]
M. flavidus *Scud.*[1]
M. flabellatus *Scud.*[1]
M. packardii *Scud.*[1]
M. minor *Scud.*[1]
M. luridus *Dodge*[1]
M. bivittatus *Say*[1]
Phoetaliotes nebrascensis (nebrascensis) *Thom.*[1]
P. nebrascensis (volucris) *Dodge*[1]
Schistocerca americana *Drury*[6]

Plecoptera

Perla ephyre *Newm.*[4]
P. lurida *Hag.*[4]
P. xanthenes *Say*[4]

EXCHANGE LIST

The following is a partial list of the species of insects in the New York State Museum which are available for exchange purposes. In return we are specially desirous, as above stated, of securing specimens of economic importance in different sections of this country and of foreign countries, and particularly of forms likely to become destructive if established in this State.

Hymenoptera

Bombus fervidus *Fabr.*
B. ternarius *Say*
B. terricola *Kirby*
B. vagans *Smith*
Xylocopa virginica *Drury*
Megachile latimanus *Say*
Andrena vicina *Smith*
Vespa arenaria *Fabr.*
V. consobrinus *Sauss.*
V. diabolica *Sauss.*
V. maculata *L.*
Polistes pallipes *St Farg.*
Odynerus capra *Sauss.*
Philanthus solivagus *Say*
Monedula ventralis *Say*
Bembex fasciata *Fabr.*
Chalybion caeruleum *Linn.*
Pelopoeus cementarius *Drury*
Ammophila communis *Cress.*
Aporus biguttatus *Fabr.*
A. marginatus *Say*
Pelecinus polyturator *Drury*
Apanteles congregatus *Say*
Lampronota americana *Cress.*
Pimpla conquisitor *Say*
P. inquisitor *Say*
Theronia fulvescens *Cress.*
Ephialtes irritator *Fabr.*
Thalessa lunator *Fabr.*
Paniscus geminatus *Say*
Anomalon exile *Prov.*
Ichneumon centrator *Say*
I. cincticornis *Cress.*
I. confirmatus *Cress.*
I. scelestus *Cress.*
I. unifasciatorius *Say*
I. laetus *Brullé*
Tremex columba *Linn.*
Allantus basillaris *Say*
Dolerus arvensis *Say*
D. sericeus *Say*
Lygaeonematus erichsonii *Hartig*
Trichiocampus viminalis *Fallen*
Cimbex americana *Leach*

Coleoptera

Cratoparis lunatus *Fabr.*
Tomicus calligraphus *Germ.*
T. cacographus *Lec.*
T. pini *Say*
T. balsameus *Lec.*
Xyleborus celsus *Eich.*
X. dispar *Fabr.*
Cossonus platalea *Say*
Calandra granaria *Linn.*
Balaninus nasicus *Say*
Mononychus vulpeculus *Fabr.*
Cryptorhynchus lapathi *Linn.*
Conotrachelus nenuphar *Hbst.*
Gymnetron teter *Fabr.*
Tachypterus quadrigibbus *Say*
Magdalis armicollis *Say*
M. barbita *Say*
M. perforata *Horn*
Lixus concavus *Say*
Hylobius pales *Hbst.*
Pissodes strobi *Peck*
Phytonomus nigrirostris *Fabr.*
P. punctatus *Fabr.*
Cyphomimus dorsalis *Horn*
Pandeletejus hilaris *Hbst.*
Otiorhynchus ovatus *Linn.*
Rhynchites bicolor *Fabr.*
Epicauta vittata *Fabr.*
E. cinerea *Forst.*
E. pennsylvanica *DeG.*
Macrobasis unicolor *Kirby*
Henous confertus *Say*
Meloe angusticollis *Say*
Notoxus anchora *Hentz.*
N. bifasciatus *Lec.*
Mordella marginata *Melsh.*
Anaspis flavipennis *Hald.*
Nacerdes melanura *Linn.*
Pytho americanus *Kirby*
Melandrya striata *Say*
Cistela sericea *Say*
Boletotherus bifurcus *Fabr.*
Hoplocephala bicornis *Oliv.*
Diaperis hydni *Fabr.*
Paratenetus punctatus *Sol.*
Tribolium ferrugineum *Fabr.*
Tenebrio tenebriodides *Beauv.*
T. molitor *Linn.*
Xylopinus saperdioides *Oliv.*
Scotobates calcaratus *Fabr.*
Merinus laevis *Oliv.*
Iphthimus opacus *Lec.*
Nyctobates pennsylvanica *DeG.*
Eleodes tricostata *Say*
Bruchus obtectus *Say*
Chelymorpha argus *Licht.*
Coptocycla aurichalcea *Fabr.*
Odontota rubra *Web.*
Microrhopala vittata *Fabr.*
Dibolia borealis *Chev.*
Phyllotreta sinuata *Steph.*
Systena hudsonias *Forst.*
S. frontalis *Fabr.*
S. bitaeniata *Lec.*
Crepidodera rufipes *Linn.*
C. helxines *Linn.*
C. cucumeris *Harr.*
Haltica bimarginata *Say*
Disonycha alternata *Ill.*
D. pennsylvanica *Ill.*
D. collaris *Fabr.*
Galerucella decora *Say*
G. luteola *Müll.*
Trirhabda canadensis *Kirby*
Diabrotica 12-punctata *Oliv.*
D. vittata *Fabr.*
Cerotoma caminea *Fabr.*
Lina scripta *Fabr.*
Gastroidea polygoni *Linn.*
Chrysomela similis *Rog.*
C. elegans *Oliv.*
C. bigsbyana *Kirby*
Doryphora clivicollis *Kirby*
D. 10-lineata *Say*
Prasocuris varipes *Lec.*
Nodonota brunnea *Fabr.*
N. tristis *Oliv.*
Graphops pubescens *Melsh.*
Metachroma marginalis *Cr.*
Typophorus aterrima *Oliv.*
Chrysochus auratus *Fabr.*
Glyptoscelis pubescens *Fabr.*
Fidia viticida *Walsh*
Xanthonia 10-notata *Say*
Monachus saponatus *Fabr.*
Chlamys plicata *Fabr.*
Babia 4-guttata *Oliv.*
Crioceris asparagi *Linn.*

C. 12-punctata *Linn.*
Lema trilineata *Oliv.*
Syneta ferruginea *Germ.*
Orsodachna atra *Ahr.*
Donacia cincticornis *Newm.*
D. rufa *Say*
Tetraopes tetraophthalmus *Forst.*
Saperda tridentata *Oliv.*
Liopus alpha *Say*
Monohammus maculosus *Hald.*
M. scutellatus *Say*
M. confusor *Kirby*
Leptura lineola *Say*
L. exigua *Newm.*
L. cordifera *Oliv.*
L. canadensis *Fabr.*
L. rubrica *Say*
L. vagans *Oliv.*
L. proxima *Say*
L. vittata *Germ.*
Typocerus velutinus *Oliv.*
Strangalia acuminata *Oliv.*
Rhagium lineatum *Oliv.*
Desmocerus palliatus *Forst.*
Euderces picipes *Fabr.*
Clytanthus ruricola *Oliv.*
Neoclytus erythrocephalus *Fabr.*
Xylotrechus colonus *Fabr.*
Cyllene robiniae *Forst.*
Molorchus bimaculatus *Say*
Elaphidion villosum *Fabr.*
Callidium antennatum *Newm.*
Prionus laticollis *Drury*
Orthosoma brunneum *Forst.*
Parandra brunnea *Fabr.*
Trichius affinis *Gory*
Osmoderma scabra *Beauv.*
O. eremicola *Knoch.*
Euphoria inda *Linn.*
Chalepus trachypygus *Burm.*
Pelidnota punctata *Linn.*
Strigoderma arboricola *Fabr.*
Anomala lucicola *Fabr.*
Lachnosterna fusca *Froh.*
L. tristis *Fabr.*
Macrodactylus subspinosus *Fabr.*
Serica trociformis *Burm.*
Dichelonycha elongata *Fabr.*
D. albicollis *Burm.*
Hoplia modesta *Hald.*
Geotrupes splendidus *Fabr.*
Bolboceras farctus *Fabr.*
Aphodius fossor *Linn.*
A. fimetarius *Linn.*
A. granarius *Linn.*
A. inquinatus *Hbst.*
Onthophagus pennsylvanicus *Harold*
O. hecate *Panz.*
Phanaeus carnifex *Linn.*
Copris anaglypticus *Say*
Canthon laevis *Drury*
Passalus cornutus *Fabr.*
Ceruchus piceus *Web.*
Dorcus parallelus *Say*
Ennearthron thoracicornis *Zeigl.*
Lyctus opaculus *Lec.*
Sitodrepa panicea *Linn.*
Ptinus quadrimaculatus *Melsh.*
Clerus quadriguttatus *Oliv.*
C. nigriventris *Lec.*
C. analis *Lec.*
Trichodes nuttali *Kirby*
Telephorus carolinus *Fabr.*
T. scitulus *Say*
T. rotundicollis *Say*
T. bilineatus *Say*
Podabrus rugulosus *Lec.*
Chauliognathus pennsylvanicus *DeG.*
C. marginatus *Fabr.*
Photuris pennsylvanicus *DeG.*
Photinus scintillans *Say*
Pyropyga nigricans *Say*
Ellychnia corrusca *Linn.*
Lucidota atra *Fabr.*
Calopteron reticulatum *Fabr.*
Brachys ovata *Web.*
Agrilus anxius *Gory*
A. ruficollis *Fabr.*
Acmeodera pulchella *Hbst.*
Chrysobothris femorata *Fabr.*
C. floricola *Gory*
C. dentipes *Germ.*
C. scabripennis *Lap. & Gory*
C. pusilla *Lap. & Gory.*
Buprestis maculiventris *Say*
Dicerca divaricata *Say*
Chalcophora virginiensis *Drury*
Asaphes decoloratus *Say*
Oxygonus obesus *Say*
Corymbites inflatus *Say*

C. cylindriformis *Hbst.*
Limonius confusus *Lec.*
Melanotus communis *Gyll.*
Dolopius lateralis *Esch.*
Elater nigricollis *Hbst.*
E. obliquus *Say*
Cryptohypnus planatus *Lec.*
Alaus oculatus *Linn.*
Tharops ruficornis *Say*
Tenebrioides corticalis *Melsh.*
Ips quadriguttatus *Fabr.*
Omosita colon *Linn.*
Nitidula bipustulata *Linn.*
Conotelus obscurus *Er.*
Colastus truncatus *Rand.*
Hister parallelus *Say*
Anthrenus scrophulariae *Linn.*
A. verbasci *Linn.*
Attagenus piceus *Oliv.*
Dermestes lardarius *Linn.*
Byturus unicolor *Say*
Triphyllus humeralis *Kirby*
Mycetophagus punctatus *Say*
M. flexuosus *Say*
Silvanus surinamensis *Linn.*
Tritona thoracica *Say*
T. humeralis *Fabr.*
Lycoperdina ferruginea *Lec.*
Epilachna borealis *Fabr.*
Brachyacantha ursina *Fabr.*
Chilocorus bivulnerus *Muls.*
Psyllobora 20-maculata *Say*
Anatis ocellata *Linn.*
Adalia bipunctata *Linn.*
Coccinella trifasciata *Linn.*
C. 9-notata *Hbst.*
C. transversalis *Muls.*
C. sanguinea *Linn.*
Hippodamia 13-punctata *Linn.*
H. parenthesis *Say*
Megilla maculata *DeG.*
Tachinus fimbriatus *Grav.*
Stenus flavicornis *Er.*
Paederus littorarius *Grav.*
Philonthus aeneus *Rossi*
Staphylinus cinnamopterus *Grav.*
S. maculosus *Grav.*
Creophilus villosus *Grav.*
Listotrophus cingulatus *Grav.*
Silpha surinamensis *Fabr.*
S. lapponica *Hbst.*
S. inaequalis *Fabr.*
S. noveboracensis *Forst.*
S. americana *Linn.*
Necrophorus marginatus *Fabr.*
N. pustulatus *Hersch*
N. tomentosus *Web.*
Sphaeridium scarabaeoides *Linn.*
Hydrobius fuscipes *Linn.*
H. globosus *Say*
Hydrocharis obtusatus *Say*
Hydrophilus triangularis *Say*
H. glaber *Hbst.*
Dineutes assimilis *Aube*
Gyrinus ventralis *Kirby*
G. picipes *Aube*
Acilius semisulcatus *Aube*
Dytiscus fasciventris *Say*
Colymbetes sculptilis *Harr.*
Agabus punctulatus *Aube*
Ilybius biguttatus *Germ.*
Deronectes griseostriatus *DeG.*
Laccophilus maculosus *Germ.*
Cnemidotus 12-punctatus *Say*
Anisodactylus rusticus *Say*
A. discoideus *Dej.*
A. interstitialis *Say*
Bradycellus rupestris *Say*
Harpalus erraticus *Say*
H. viridiaeneus *Beauv.*
H. caliginosus *Fabr.*
H. pennsylvanicus *DeG.*
H. herbivagus *Say*
Agonoderus pallipes *Fabr.*
Chlaenius sericeus *Forst.*
C. tricolor *Dej.*
C. pennsylvanicus *Say*
C. tomentosus *Say*
Lebia grandis *Hentz*
L. viridis *Say*
Galerita janus *Fabr.*
Calathus gregarius *Say*
Dicaelus elongatus *Bon.*
Amara impuncticollis *Say*
Pterostichus stygicus *Say*
P. lucublandus *Say*
P. corvinus *Dej.*
P. patruelis *Dej.*
P. femoralis *Kirby*
Tachys nanus *Gyll.*

Bembidium quadrimaculatum *Linn.*
Scarites subterraneus *Fabr.*
Pasimachus elongatus *Lec.*
Nebria sahlbergi *Fisch.*
Elaphrus ruscarius *Say*
Calosoma calidum *Fabr.*
Carabus vinctus *Web.*
Omophron americanum *Dej.*
Cicindela lecontei *Hald.*
C. sexguttata *Fabr.*
C. generosa *Dej.*
C. vulgaris *Say*
C. repanda *Dej.*
C. purpurea Oliv.
C. 12-guttata *Dej.*
C. punctulata *Fabr.*

Diptera

Physocephala furcillata *Will.*
Drosophila ampelophila *Loew.*
Chloropisca variceps *Loew.*
Piophila casei *Linn.*
Lauxania flaviceps *Loew.*
Trypeta longipennis *Wied.*
Rhagoletis cingulata *Loew.*
Phorbia fusciceps *Rondani*
Pollenia rudis *Fabr.*
Belvoisia unifasciata *Desv.*
Ocyptera carolinae *Desv.*
Tachina mella *Walk.*
Echinomyia algens *Wied.*
Gonia capitata *DeG.*
Archytas analis *Fabr.*
Spilomyia fusca *Loew.*
Syritta pipiens *Linn.*
Helophilus similis *Macq.*
Eristalis dimidiatus *Wied.*
E. tenax *Linn.*
E. transversus *Wied.*
Rhingia nasica *Say*
Sphaerophoria cylindrica *Say*
Mesograpta marginata *Say*
Syrphus lesueurii *Macq.*
S. ribesii *Linn.*
S. americanus *Wied.*
Platycherus quadratus *Say*
Tabanus atrata *Fabr.*
T. reinwardtii *Wied.*
T. lineola *Fabr.*
Therioplectes microcephalus *O. S.*
Chrysops vittatus *Wied.*
C. excitans *Walk.*
C. niger *Macq.*
Pangonia tranquilla *O. S.*
Bibio albipennis *Linn.*

Lepidoptera

Papilio glaucus turnus *Linn.*
Pontia rapae *Linn.*
Eurymus philodice *Godt.*
Argynnis aphrodite *Fabr.*
A. atlantis *Edw.*
Brenthis myrina *Cram.*
B. bellona *Fabr.*
Phyciodes tharos *Dru.*
Eugonia j-album *Boisd.*
Euvanessa antiopa *Linn.*
Vanessa atalanta *Linn.*
Basilarchia arthemis *Dru.*
B. archippus *Cram.*
Anosia plexippus *Linn.*
Feniseca tarquinius *Fabr.*
Heodes hypophleas *Boisd.*
Samia cecropia *Linn.*
Callosamia promethia *Dru.*
Lycomorpha pholus *Dru.*
Ctenucha virginica *Charp.*
Eubaphe aurantiaca *Hub.*
Haploa confusa *Lyman*
Estigmene acraea *Dru.*
Isia isabella *Sm. & Abb.*
Diacrisia virginica *Fabr.*
Apantesis virgo *Linn.*
A. parthenice *Stretch.*
Halisidota tessellaris *Sm. & Abb.*
H. caryae *Harr.*
Alypia octomaculata *Fabr.*
Hadena passer *Guen.*
H. dubitans *Walk.*
H. devastatrix *Brace.*
H. arctica *Boisd.*
Pyrophila pyramidoides *Guen.*
Adelphagrotis prasina *Fabr.*
Peridroma margaritosa *Harr.*
Noctua smithii *Snell.*

N. bicarnea *Guen.*
N. c-nigrum *Linn.*
N. clandestina *Harr.*
Feltia subgothica *Haw.*
F. jaculifera *Guen.*
Paragrotis redimicula *Morr.*
Mamestra purpurissata *Grote*
M. meditata *Grote*
M. renigera *Steph.*
M. olivacea *Morr.*
Nephelodes minians *Guen.*
Heliophila unipuncta *Haw.*
H. luteopallens *Smith*
Tricholita signata *Streck.*
Gortyna nictitans *Bork.*
Orthosia helva *Grote*
Plusia aerea *Hübn.*
P. aeroides *Grote*
Autographa bimaculata *Steph.*
A. precationis *Guen.*
A. brassicae *Riley*
A. rectangula *Kirby*
A. u-aureum *Guen.*
A. falcigera *Kirby*
Eustrotia carneola *Guen.*
Notolophus badia *Hy. Edw.*
Hemerocampa leucostigma *Abb. & Sm.*
Eudule mendica *Walk.*
Cingilia catenaria *Dru.*
Sabulodes transversata *Dru.*
Sesia tipuliformis *Clerck.*
Desmia funeralis *Hübn.*
Evergestis straminalis *Hübn.*
Tholeria reversalis *Guen.*

Trichoptera

Leptocerus resurgens *Walk.*
Hydropsyche scalaris *Hag.*
Halesus guttifer *Walk.*
Goniotaulius dispectus *Walk.*
Neuronia postica *Walk.*

Mecoptera

Panorpa rufescens *Rambur*
P. maculosa *Hag.*
Bittacus strigosus *Hag.*

Neuroptera

Polystoechotes punctatus *Fabr.*
Corydalis cornuta *Linn.*

Hemiptera

Canthophorus cinctus *Beauv.*
Podisus maculiventris *Say*
P. placidus *Uhler*
Brochymena 4-pustulata *Fabr.*
Cosmopepla carnifex *Fabr.*
Euschistus servus *Say*
E. tristigmus *Say*
E. fissilis *Uhler*
E. variolarius *P. B.*
Coenus delius *Say*
Pentatoma juniperana *Linn.*
Murgantia histrionica *Hahn.*
Nezara hilaris *Say*
Anasa tristis *DeG.*
Alydus eurinus *Say*
Leptocoris trivittatus *Say*
Blissus leucopterus *Say*
Lygaeus turcicus *Fabr.*
Leptopterna dolobrata *Linn.*
Calocoris rapidus *Say*
Lygus pratensis *Linn.*
Poecilocapsus lineatus *Fabr.*
Capsus ater *Linn.*
Piesma cinerea *Say*
Corythuca arcuata *Say*
Phymata wolffii *Her. Sch.*
Nabis rufusculus *Reut.*
Acholla multispinosa *DeG.*
Limnotrechus marginatus *Say*
Belostoma americana *Leid.*
Notonecta undulata *Say*
Cicada tibicen *Linn.*
C. septendecim *Linn.*
Publilia concava *Say*

P. bicinctus *Godg.*
Ceresa bubalus *Fabr.*
C. diceros *Say*
Stictocephala inermis *Fabr.*
Smilia camelus *Fabr.*
Telamona ampeloposidis *Harr.*
Enchenopa binotata *Say*
Ormenis pruinosus *Say*
Aphrophora saratogensis *Fitch*
A. quadrangularis *Say*
Clastoptera proteus *Fitch*
Diedrocephala mollipes *Say*
D. coccinea *Forst.*
D. noveboracensis *Fitch*
Helochara communis *Fitch*
Thamnotettix clitellarius *Say*
Empoasca rosae *Harr.*
Trioza tripunctata *Fitch*

Coccidae

Lepidosaphes ulmi *Linn.*
Aspidiotus perniciosus *Comst.*
A. ostreaeformis *Curt.*
A. ancylus *Putn.*
A. abietis *Schr.*
Aulacaspis rosae *Bouché*
Diaspis boisduvalii *Sign.*
Chionaspis furfura *Fitch*
C. euonymi *Comst.*
C. americana *Johns.*
Eulecanium nigrofasciatum *Perg.*
Pulvinaria innumerabilis *Rathv.*
Gossyparia spuria *Modeer*
Kermes galliformis *Riley*

CONTRIBUTIONS TO COLLECTION OCT. 16, 1902–OCT. 15, 1903

Hymenoptera

Bombus vagans Smith, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Melissodes sphaeralceae Ckll., adult, Sep. 10, **T. D. A. Cockerell**, Pecos N.M.

Megachile cleomi? Ckll., adult, Sep. 10, **T. D. A. Cockerell**, Pecos N.M.

M. sapelloni? Ckll., adult, Sep. 10, **T. D. A. Cockerell**, Pecos N.M.

M. monardarum Ckll., adult, Sep. 10, **T. D. A. Cockerell**, Pecos N.M.

Perdita stotteri Ckll., adult, Sep. 10, **T. D. A. Cockerell**, Pecos N.M.

Camponotus herculaneus Linn., adult, May 21, **F. R. Calkins**, Ossining N.Y.

C. var. pennsylvanicus DeG. large black ant, work on balsam, Oct. 31, **Jonas H. Brooks**, Albany N.Y.

Pteromalus puparum Linn., adult, from Euvanessa antiopa Linn., Feb. 8, **J. H. Cook**, Albany N.Y.

Biorhiza forticornis Walsh, oak fig gall on oak, Aug. 24, **C. H. Peck**, Albany N.Y.

Urocerus tricolor Prov., adult, July 18, **James Roy & Co.**, Troy N.Y.

Dolerus arvensis Say, adult, Ap. 30, **F. R. Calkins**, Ossining N.Y.

Emphytus cinctipes Nort., July 11, **C. J. Locke**, Ogdensburg N.Y.

Coleoptera

Phytonomus nigrirostris Fabr., adult, on clover, Mar. 25, **F. R. Calkins**, Ossining N.Y.

Mycetochares binotata Say, adult, July 11, **C. J. Locke**, Ogdensburg N.Y.

Spermophagus robinae Sch., adult, June 6, **Reinlein Gasoline Torch Co.**, Mt Vernon Ill.

Chelymorpha argus Licht., argus beetle, adult, June 6, **C. J. Locke**, Ogdensburg N.Y.

Coptocycla bicolor Fabr., golden tortoise beetle, adult on peach leaves, May 30, **Emma S. Thomas**, Schoharie N.Y. Same, adult, June 6, **C. J. Locke**, Ogdensburg N.Y.

Galerucella luteola Müll., elm leaf beetle, adult on elm, May 25, **F. R. Calkins**, Ossining N.Y. Same, eggs and larvae on elm, July 13, **F. R. Calkins**, Ossining N.Y.

Diabrotica vittata Fabr., adult on squash, May 25, **F. R. Calkins**, Ossining N.Y.

Chrysomela bigsbyana Kirby, adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Doryphora clivicollis Kirby, adult, July 11, **C. J. Locke**, Ogdensburg N.Y.

Chrysochus auratus Fabr., golden gilt beetle, adults on dogbane, July 16, **J. Jay Barden**, Dansville N.Y. Same, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Diabrotica vittata Fabr., striped cucumber beetle, adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Crioceris 12-punctata Linn., 12-spotted asparagus beetle, adult, June 3, **C. H. Peck**, Menands N.Y.

C. asparagi Linn., asparagus beetle, adult on asparagus, May 25, **C. L. Williams**, Glens Falls N.Y. Same, adult on asparagus Sep. 3, **W. F. Greene**, Mt Vernon N.Y.

Tetraopes tetraophthalmus Forst., adult, July 11, **C. J. Locke**, Ogdensburg N.Y.

Oberea bimaculata Oliv., raspberry cane girdler work on raspberry canes, June 24, **John U. Metz**, Swormville N.Y.

Centrodera decolorata Harr., adult on butternut, Jan. 5, **G. S. Graves**, Newport N.Y.

Desmocerus palliatus Forst., adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Cyllene robiniae Forst., locust borer, Oct. 18, **W. C. Hitchcock**, Pittstown N.Y. Same, larvae on locust, June 16, **M. T. Richardson**, Brooklyn N.Y.

Prionus laticollis Drury, broad-necked Prionus, adult, July 20, **Miss M. J. Tyers**, Dobbs Ferry N.Y.

Ligyrus gibbosus DeG. adult, June 6, **Reinlein Gasoline Torch Co.**, Mt Vernon Ill.

Pelidnota punctata Linn., spotted grapevine beetle, Oct. 18, **W. C. Hitchcock**, Pittstown N.Y.

Lachnosterna fusca Fröhl., larva, June 25, **C. J. Locke**, Ogdensburg N.Y.

Diplotaxis liberta Germ., adults on peach, Sep. 24, **J. R. Crandall**, Hauppauge N.Y.

Macrodactylus subspinosus Fabr., rose beetle, adult on fruit trees, June 16, **H. A. Jordan**, Coxsackie N.Y.

Dichelonycha elongata Fabr., adult, June 6, **C. J. Locke**, Ogdensburg N.Y.

Lyctus parallelopipedus Melsh., adults in ash, July 10, **Joseph P. McHugh & Co.**, New York.

Collops vittatus Say, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Telephorus carolinus Fabr., adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Podabrus rugulosus Lec., adult, June 25, **C. J. Locke**, Ogdensburg N.Y. Same, adult, July 11, **C. J. Locke**, Ogdensburg N.Y.

Lampyrid, larva, June 12, **George S. Graves**, Newport N.Y.

Chalcophora virginiensis Drury, adults, Oct. 18, **W. C. Hitchcock**, Pittstown N.Y.

Melanotus communis Gyll., adult, July 11, **C. J. Locke**, Ogdensburg N.Y.

Dolopius lateralis Esch., adult, July 11, **C. J. Locke**, Ogdensburg N.Y.

Alaus oculatus Linn., owl beetle, adult, July 9, **C. L. Daggett**, Albany N.Y. Same, adults, July 27, **Fred G. Carnes**, W. Chazy N.Y.

Anthrenus verbasci Linn., adult, May 25, **F. R. Calkins**, Ossining N.Y.

Chilocorus bivulnerus Muls., twice-stabbed ladybeetle, adult (feeding on San José scale) June 13, **Mr Hotchkin**, Binghamton N.Y.

Adalia bipunctata Linn., two-spotted lady beetle, adult, July 31, **George S. Graves**, Newport N.Y. Same on Norway maple, June 12, **M. F. Tiger**, Patchogue N.Y. Same, larvae on rose, June 3, **Mrs A. G. Dana**, Far Rockaway N.Y.

Coccinella transversalis Muls., adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

C. 9-notata Herbst, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Hydrophilus triangularis Say, adult, June 16, **Frances McCarty**, Albany N.Y.

Harpalus erraticus Say, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Agonoderus pallipes Fabr., adult., May 21, **F. R. Calkins**, Ossining N.Y.

Pterostichus lucublandus Say, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Cicindela punctulata Fabr., adult, July 6, **Richard Lohrmann**, Herkimer N.Y.

C. repanda Dej., adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

C. vulgaris Say, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

C. generosa Dej., adult, July 6, **Richard Lohrmann**, Herkimer N.Y.

C. 6-guttata Fabr., adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Siphonaptera

Ceratopsyllus serraticeps, cat flea, adult, infesting house, Sep. 14, **Otis Arnold**, Albany N.Y.

Diptera

Mosquito, larvae and adults, July 11, **C. J. Locke**, Ogdensburg N.Y.

Psorophora ciliata Fabr., adult, Aug. 6, **H. C. Weeks**, Sheepshead Bay, Brooklyn N.Y.

Chironomids, adult, Ap. 30, **F. R. Calkins**, Ossining N.Y.

Lasioptera vitis? O. S., June 4, **Francesco Landini**, New York.

Theriopletes affinis adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Tabanus atratus Fabr., mourning horsefly, adult, July 7, **Abraham Knechtel**, Albany N.Y.

Syrphus ribesii Linn., adult, Ap. 30, **F. R. Calkins**, Ossining N.Y.

Stratiomyid, adult, May 25, **C. L. Williams**, Glens Falls N.Y.

Tachinid sp., puparium infesting stalk borer, July 15, **C. L. Williams**, Glens Falls N.Y.

Pollenia rudis Fabr., cluster fly, adults in house, Sep. 1, **K. B. Christman**, Burtonville N.Y.

Phorbia brassicae Bouché, cabbage root maggot, larvae in turnips, Nov. 18, **J. J. Cormot**, Phoenix R.I.

P. ceparum Meigen, onion maggot, grubs on onions, June 19, **Mr VanDerzee**, Kenwood N.Y. Same, Mar. 25, **F. R. Calkins**, Ossining N.Y.

Trypeta longipennis Weid., adult, on Helianthus, July 31, **George S. Graves**, Newport N.Y.

Lepidoptera

Papilio polyxenes Fabr., adult, Feb. 11, **R. K. Colville**, Kenwood N.Y. Same, larva, June 16, **Mrs Humphrey**, Watervliet N.Y.

Pieris oleracea Harr., cabbage butterfly, adult, July 14, **Carl Heiser**, Malone N.Y.

Basilarchia arthemis Dr. banded purple, adult, June 17, **Mrs A. M. A. Jackson**, Camillus N.Y.

Sphecodina abbotii Swains, Oct. 18, **W. C. Hitchcock**, Pittstown N.Y.

Samia cecropia Linn., cecropia moth, adult eggs, June 12, **A. Saunders**, Ridge road, Irondequoit N.Y.

Telea polyphemus Cramer, egg and cocoon, June 6, **C. J. Locke**, Ogdensburg N.Y.

Ctenucha virginica Charp., adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Estigmene acraea Dr. salt marsh caterpillar, adult, June 9, **George S. Graves**, Newport N.Y.

Alypia octomaculata Fabr., 8-spotted forester, larvae on virginia creeper, July 26, **Percy MacG. Allen**, Albany N.Y.

Noctua clandestina Harr., adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Feltia subgothica ? Haworth, larva on cabbage, June 25, **C. J. Locke**, Ogdensburg N.Y.

Mamestra picta Harr., zebra caterpillar, larva on strawberry, June 9, **C. L. Williams**, Glens Falls N.Y.

Heliophila pseudargyria Guenée, adults, May 21, **F. R. Calkins**, Ossining N.Y.

Xylina laticinerea? Grote, larva on peach, May 28, **Henry G. Parsons**, Milton N.Y.

Heliothis Armiger Hübn., corn worm, larva on corn, Aug. 25, **Dr M. W. VanDenburg**, Mt Vernon N.Y.

Heterocampa bilineata Pack., larvae on beech, July 12, **E. H. Mairs**, Irvington N.Y.

Notolophus antiqua Linn., larva, June 25, **C. J. Locke**, Ogdensburg N.Y.

Tolype velleda? Stoll, lappet moth, larva on apple, June 13, **Mr Hotchkin**, Binghamton N.Y.

Hydria undulata Linn., on cherry, Aug. 15, **C. R. Pettis**, Saranac Inn N.Y.

Prionoxystus ? robiniae Peck, larvae on beech. Jan. 5, **George S. Graves**, Newport N.Y.

Sanninoidea exitiesa Say, Oct. 18, **W. C. Hitchcock**, Pittstown N.Y.

Sesia acerni Clem., maple seslan, larva on maple, Sep. 18 **W. C. H.**, Hartley Hall Pa.

Evergestis straminalis Hübn., black headed cabbage worm, larvae on turnip, july 22, **George S. Graves**, Newport N.Y.

Hypsopygia costalis Fabr., clover hay worm, larvae, Mar. 16, **J. Mace Smith**, Ithaca N.Y.

Archips rosaceana Harr., adult, June 6, **Reinlein Gasoline Torch Co.**, Mt Vernon N.Y. Same, July 11, **C. J. Locke**, Ogdensburg N.Y. Same, larva on rose, June 25, **C. J. Locke**, Ogdensburg N.Y.

Gelechia aceriella Clem., larva on maple, Aug. 27, **George S. Graves**, Newport N.Y.

Bucculatrix pomifoliella Clem., apple leaf Bucculatrix, cocoons on apple, Nov. 17, **L. L. Woodford**, Berwyn N.Y.

Tineola biselliella Hummel, clothes moth, larva in a mattress, June 25, **Mrs P. N. Nicholas**, Geneva N.Y.

Neuroptera

Psocus venosus Burm., on maple, Aug. 12, **George S. Graves**, Newport N.Y.

Sialis infumata Newm., alder fly, June 6, **C. J. Locke**, Ogdensburg N.Y.

Trichoptera

Mystacides nigra Linn., July 11, **C. J. Locke**, Ogdensburg N.Y.

Plecoptera

Taeniopteryx fasciata Burm., Mar. 25, **F. R. Calkins**, Ossining N.Y.

Pteronarcys regalis Newm., adult, June 6, **C. J. Locke**, Ogdensburg N.Y.

Hemiptera

Canthophorus cinctus Beauv., adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

?Nezara hilaris DeG., nymphs killing asparagus beetle grubs, Sep. 3, **W. F. Greene**, Mt Vernon N.Y.

Leptopterna dolobrata Linn., on wheat, June 15, **J. Jay Barden**, Stanley N.Y. Same, adult, June 25, **C. J. Locke**, Ogdensburg N.Y. Same, July 11, **C. J. Locke**, Ogdensburg N.Y.

Calocoris rapidus Say, adult, June 25, **C. J. Locke**, Ogdensburg N.Y.

Poecilocapsus lineatus Fabr., July 11, **C. J. Locke**, Ogdensburg N.Y.

Capsus ater Linn., adult, June 25, **C. J. Locke**, Ogdensburg N.Y. Same, July 11, **C. J. Locke**, Ogdensburg N.Y.

Acanthia lectularia Linn., bedbug, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Corythuca marmorata Uhler, adults on chrysanthemum, June 1, **Harry Blauvelt**, Coeyman N.Y.

Coriscus subcoleopterus Kirby, adult, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Acholla multispinosa DeG. nymphs on grape, May 25, **F. R. Calkins**, Ossining N.Y.

Cicada tibicen Linn., harvest fly, adult, Aug. 12, **George S. Graves**, Newport N.Y. Same, Aug. 24, **H. B. Taylor**, Albany N.Y.

Ceresa taurina Fitch, tree hopper scars on apple, Ap. 24, **Mr Niles**, Chatham N.Y.

Telemona reclivata? Fitch, July 11, **C. J. Locke**, Ogdensburg N.Y.

Psylla pyricola Riley, pear psylla, all stages on pear, July 26, **Jacob H. Wagar**, Cropseyville N.Y. Same, nymphs on pear, Aug. 17, **Miss M. L. Williams**, Sherburne N.Y. Same, pupa on pear, May 25, **G. F. White**, Preston Hollow N.Y.

Chermes pinicorticis Fitch, pine bark chermes, eggs on white pine, May 2, **C. R. Pettis**, Saranac Inn N.Y.

Pemphigus tessellatus Fitch, larvae and adult on alder, Aug. 29, **C. R. Pettis**, Saranac Inn N.Y.

P. popularius Fitch, adult on poplar P. balsamifera, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Hormaphis hamamelidis Fitch, galls on witch hazel, Aug. 12, **George S. Graves**, Newport N.Y.

Schizoneura americana Riley, adults on elm, June 15, **C. J. Locke**, Ogdensburg N.Y.

Lachnus viminalis Fonsc., adult, May 25, **F. R. Calkins**, Ossining N.Y.

Drepanosiphum acerifolii Thos., adults on Acer saccharinum June 26, **George S. Graves**, Newport N.Y.

Aphis gossypii Glover, adults and larvae on tomato, Aug. 6, **C. H. Peck**, Menands N.Y.

?Nectarophora tiliae Monell, basswood louse, eggs on basswood, Nov. 24, **L. L. Woodford**, Berwyn N.Y.

Nectarophora rudbeckiae Fitch, adults on Rudbeckia laciniata, June 25, **G. G. Atwood**, Albany N.Y.

Myzus ribis Linn.? on Ribes aureum, July 8, **W. H. Harrison**, Lebanon Springs N.Y.

M. cerasi Fabr., on cherry, May 25, **F. R. Calkins**, Ossining N.Y. Same, larvae and adult on Prunus pennsylvanica, July 24, **C. R. Pettis**, Saranac Inn N.Y.

Rhopalosiphum solani Thos., tomato louse, all stages, on tomato, June 9, **J. M. Dolph**, Port Jervis N.Y.

Callipterus betulaecolens Fitch, birch leaf aphis on cut leaved birch, Aug. 8, **E. P. VanNess**, East Greenbush N.Y.

Lepidosaphes ulmi Linn., appletree bark louse, eggs on lilac, Mar. 17, **T. L. M.**, Staten Island N.Y. Same, adults on willow, May 2, **M. T. Richardson**, New York.

Chrysomphalus tenebricosus Comst., gloomy scale insect, on maple, Dec. 29, **G. W. Herrick**, Vicksburg Miss.

Aspidiotus perniciosus Comst., San José scale, adults and young on apple, Nov. 3, **Edward V. Cox**, New York city. Same, adults and young on peach and plum, Dec. 29, **G. W. Herrick**, Ellisville Miss. Same, adults on Japanese quince, Feb. 23, Albany N.Y. Same, young adults on Japanese quince, May 7, **M. T. Richardson**, New York. Same, adults on apple, May 16, **A. N. Cloud**, Coxsackie N.Y. Same, adults on pear, June 9, **George M. Adams**, Spencerport N.Y.

A. forbesi Johns., cherry scale insect, adults on cherry, Dec. 29, **Glenn W. Herrick**, Meridian Miss.

A. ancylus Putn., Putnam's scale, young on apple (fruit) Nov. 10, **C. H. Darrow**, Geneva N.Y. Same, adult on white birch, Ap. 7, **Prof. C. F. Hodge**, Clark University, Worcester Mass.

Poliaspis carissae Ckll., adults on carissa, Dec. 22, **T. D. A. Cockerell**, East Las Vegas N.M.

Pheuacaspis natalensis Ckll., adults on mango, Dec. 12, **T. D. A. Cockerell**, East Las Vegas N.M.

Aulacaspis rosae Bouché, rose scale insect, on blackberry, Nov. 24, **L. L. Woodford**, Berwyn N.Y.

Chionaspis euonymi Comst., euonymus scale, adults on euonymus, Sep. 19, **T. W. Baldwin**, Nyack N.Y.

C. lintneri Comst., adults on cornus, Ap. 27, **H. C. Peck**, Rochester N.Y.

Eulecanium tulipifereae Cook, tuliptree scale insect, adults and young on tulip, Aug. 2, **Mrs W. H. Whitaker**, Flushing N.Y.

E. prunastri? Fonsc., New York plum scale, adults on pear, June 12, **E. L. Mitchell**, Clarksville N.Y.

E. nigrofasciatum Perg., black banded lecanium on peach, May 1, **G. S. Clarke**, Milton N.Y.

E. armeniacum Craw., adults on crimson rambler rose, May 26, **Myron S. Wheeler**, Berlin Mass.

Coccus hesperidum Linn., on begonia, June 6, **C. J. Locke**, Ogdensburg N.Y.

Lecanium sp., adult on trumpet vine, June 10, **C. E. Eldridge**, Leon N.Y.

Pulvinaria innumerabilis Rathv., maple tree scale insect, adult on maple, June 20, **M. T. Tyers**, Dobbs Ferry N.Y.

Halimococcus lampas Ckll., adults on palm, Dec. 22, **T. D. A. Cockerell**, East Las Vegas N.M.

Orthoptera

Ceuthophilus maculatus Say, spotted wingless grasshopper, adult, May 15, **C. E. Wieting**, Cobleskill N.Y.

Thysanura

Achorutes packardi Folsm., adults on peartree bark Ap. 7, **A. W. K. Lick**, Germantown N.Y.

Arachnida

Micrathena sagittata Walck., adult killing asparagus beetles, Sep. 3, **W. F. Greene**, Mt Vernon N.Y.

Ixodes cruciarius Fitch, tick, Ap. 21, **C. H. North**, Dannemora N.Y.

Dermacentor americanus, the dog or wood tick, adult on dog, July 26, **E. N. Huyck**, Rensselaerville N.Y.

Chernes sanborni Hagen, adult on house fly, Sep. 7, **Dr H. E. Smith**, Norwich N.Y.

Trombidium muscarum Riley, adults on house fly, Sep. 7, **Dr H. E. Smith**, Norwich N.Y.

Phytoptus quadripes Shimer, galls on Acer dasycarpum, July 3, **G. G. Atwood**, Albany N.Y.

Bryobia pratensis Garm., clover mite, eggs on peach, Nov. 17, **L. L. Woodford**, Berwyn N.Y.

Gamasus sp. adult? May 21, **F. R. Calkins**, Ossining N.Y

Myriapoda

Scutigera forceps Raf., house centipede, adults in house, Sep. 22, **Chancey Whitmyre**, Schenectady N.Y.

The following is a small collection, except a few species which have not been determined, of insects kindly contributed by Mr J. R. de la Torre Bueno of New York city, who collected the same in that vicinity.

Cossonus platalea *Say*
Centrinus picumnus *Hbst.*
C. scutellum-album *Say*
Madarus undulatus *Say*
Baris transversa *Say*
Copturus minutus *Lec.*
Conotrachelus seniculus *Lec.*
C. nenuphar *Hbst.*
Gymnetron teter *Fabr.*
Anthonomus signatus *Say*
Otidocephalus chevrolatii *Horn*
Phytonomus nigrirostris *Fabr.*
P. punctatus *Fabr.*
Apion nigrum *Hbst.*
Sitones flavescens *Marsh*
S. hispidulus *Germ.*
Aphrastus taeniatus *Gyll.*
Otiorhynchus ovatus *Linn.*
Phyxelis rigidus *Say*
Attelabus nigripes *Lec.*
Rhynchites bicolor *Fabr.*
Eugnamptus collaris *Fabr.*
Rhipiphorus limbatus *Fabr.*
Mordellistena aspersa *Melsh.*
M. comata *Lec.*
M. trifasciata *Say*
Mordella marginata *Melsh.*
Bruchus musculus *Say*
Cerotoma caminea *Fabr.*
Trichius affinis *Gory.*
Ligyrus gibbosus *DeG.*
Chalepus trachypygus *Burm.*
Anomala lucicola *Fabr.*
Macrodactylus subspinosus *Fabr.*
Chauliognathus pennsylvanicus *DeG.*
Photinus consanguineus *Lec.*
Lucidota atra *Fabr.*
Calopteron reticulatum *Fabr.*
Adalia bipunctata *Linn.*
Coccinella 9-notata *Hbst.*
Hippodamia glacialis *Fabr.*
Silpha surinamensis *Fabr.*
Harpalus caliginosus *Fabr.*
Casnonia pennsylvanica *Linn.*
Cicindela punctulata *Fabr.*

EXPLANATION OF PLATES

PLATE 1

Dorsal view of Eniscopilus arcuatus Felt

PLATE 2

Ophionid wings

1 Ophion ferruginipennis Felt
2 Ophion bifoveolatum Brullé
3 Ophion bilineatum Say
4 Eniscopilus appendiculatus Felt
5 Ophion abnormum Felt
6 Eremotylus macrurus Linn.

PLATE 3

Work of Chrysanthemum lace-bug, Corythuca marmorata Uhler

PLATE 4

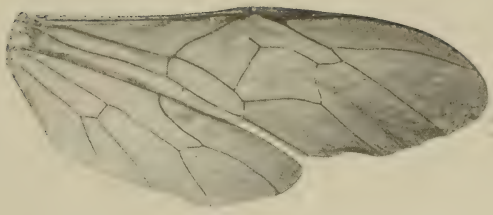
Chrysanthemum lace-bug

Corythuca marmorata Uhler

1 Section of leaf showing insertion of eggs below the surface
2 Dorsal spines of stage 1: *a*, arising from cone-shaped base, *b*, directly from the body
3 Lateral abdominal spine of stage 1
4 Dorsal view of nymph in stage 2
5 Dorsal spines of stage 2: *a*, arising from cone-shaped base, *b*, directly from the body
6 Lateral abdominal spine of stage 2
7 Dorsal spines of stage 3: *a*, arising from cone-shaped base, *b*, directly from the body
8 Lateral abdominal spines of stage 3
9 Dorsal view of nymph in stage 4
10 Lateral abdominal spines of stage 4
11 Dorsal spines of stage 4: *a*, arising from cone-shaped base, *b*, directly from the body
12 Lateral abdominal spines of stage 5
13 Antennae in stage 5

Plate 1

Eniscopilus arcuatus



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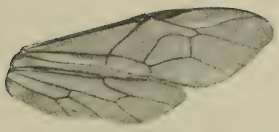

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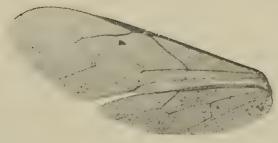


4

3

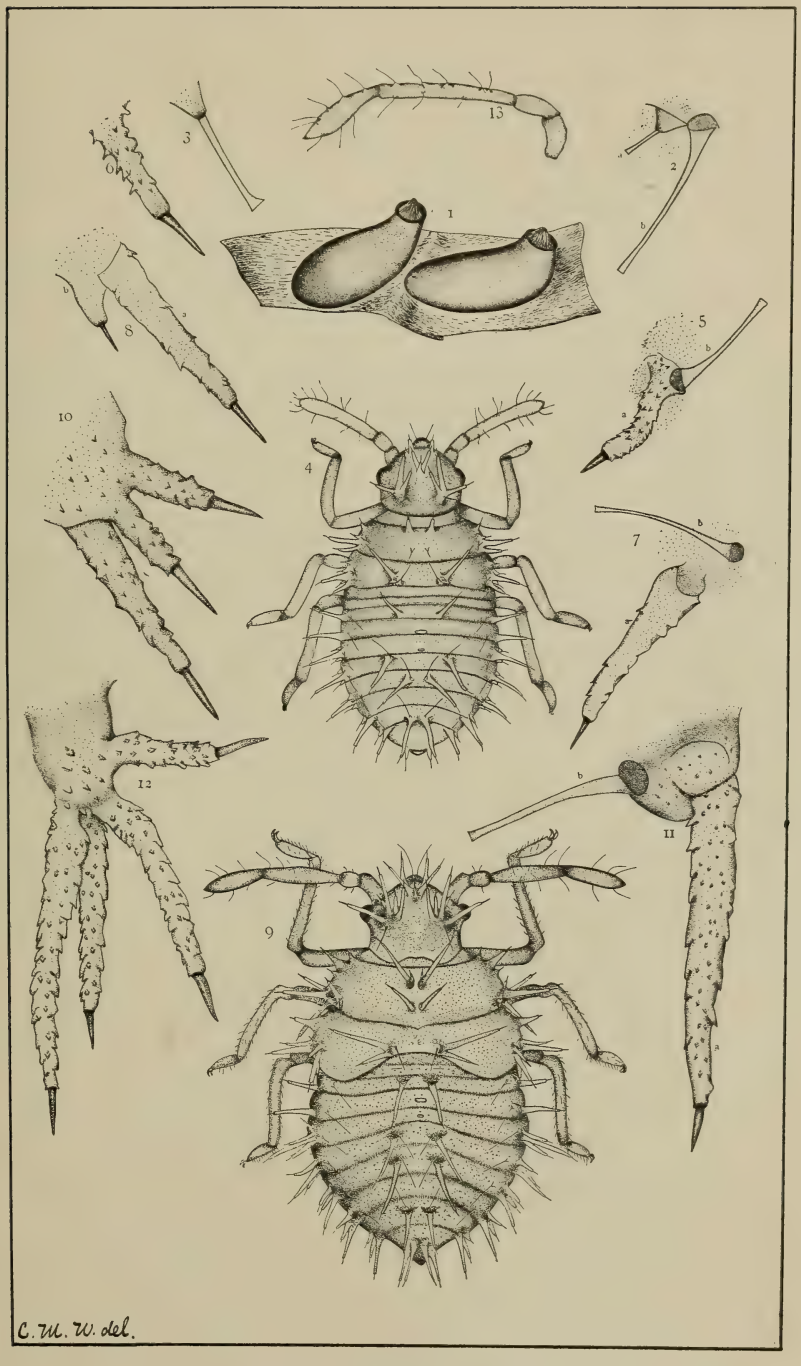
5

6

Ophionid wings

Plate 3

Work of chrysanthemum lace bug



Chrysanthemum lace bug

INDEX

abnormum, Ophion, 114, 121-22.
acerifolii, Drepanosiphum, 135, 181-82, 192.
aceris, Chaitophorus, 134, 191.
acerni, Sesia, 200.
Acknowledgments, 96.
Adalia bipunctata, 136.
Adirondacks, relation of forest fires to insect attack, 168-69.
Admiral butterflies, red, 184.
agarici, Phora, 193.
agassizii, Halisidota, 106.
Agrilus anxius, 186.
Albany county, summary of voluntary reports from, 174.
albifrons, Symmerista, 118.
Alder, webworm injuring, 183.
Allen Nursery Co., certificate issued to, 95.
Ambrosia beetle, 169, 170, 172.
American economic entomology, literature of, 196.
americana, Apatela, 183.
americana, Malacosoma, *see* Malacosoma americana.
americana, Schizoneura, 181.
Anasa tristis, 175, 177, 180, 185, 189.
? Anthonomus signatus, 187.
antiopa, Euvanessa, 180, 185, 186.
Ants, 184, 198.
anxius, Agrilus, 186.
Apatela americana, 183.
Apatelodes torrefacta, 102.
Aphids, *see* Plant lice.
Aphis, apple, 131-33, 177, 182, 185, 187, 189, 191.
birch, 136.
cabbage, 133-34, 176, 180, 182.
cherry, 133, 175, 177, 185, 186, 188.
elm, 134-35.
wooly beech, 136.
Aphis brassicae, 133-34, 176, 180, 182.
mali, 131-33, 177, 182, 185, 187, 189, 191.
appendiculatus, Eniscopilus, 108, 113.
Appletree, insects injurious to:
Aphis mali, 177, 182, 185, 189.
Hyphantria textor, 182, 183, 188.
Macrodactylus subspinosus, 181.
Myzus cerasi, 185.
plant lice, 177, 182, 185, 187.
Psocus ? venosus, 182.
Saperda candida, 186.
Tmetocera ocellana, 183.
Appletree aphis, 131-33, 177, 182, 185, 187, 189, 191.
Appletree bark louse, 195.
Appletree borer, 186.
Appletree tent caterpillar, 138-39, 175, 176, 177, 178, 180, 181, 183, 184, 186, 188, 190, 191, 193.
Appletree worm, yellow-necked, 182.
Apricots, Diabrotica 12-punctata injuring, 138.
Aquatic Chrysomelidae, 199.
Aquatic insects of New York state, 93, 94, 200.
Aquatic Nematocerous Diptera, 199.
Arachnida, contributions of, 220.
arctiae, Eremotylus, *see* Eremotylus arctiae.
arcuatus, Eniscopilus, 108, 112-13.
armicollis, Magdalis, 167.
Army worm, parasite of, 109.
Arsenate of lead, 142, 148, 194, 195, 196, 199.
Arsenical poison, 137.
Ash, mountain, Diplotaxis frondicola injuring, 137.
Ashmead, W. H. acknowledgments to, 97, 105; cited, 104, 105, 106, 111, 116, 120.
asparagi, Crioceris, *see* Crioceris asparagi.
Asparagus beetle, 143, 176, 178-79, 189, 197.
spotted, 190.

Aspen, Chaitophorus populicola injuring, 136.
Aspidiotus perniciosus, 91, 140-41, 151-66, 192, 193, 194, 195, 196, 197.
Aster, insects injurious to:
Lygus pratensis, 145.
sawfly, 188.
atalanta, Vanessa, 184.
Automeris io, 102, 105.

Balm of Gilead, Pemphigus popularius injuring, 136.
Balsam, insects injurious to:
Chrysobothris pusilla, 172.
Chrysobothris scabripennis, 172.
Polygraphus rufipennis, 169.
Xyloterus lineatus, 172.
barbita, Magdalis, 167.
Barden, J. J., acknowledgments to, 95.
Bark beetle, coarse-writing, 167.
pine, 167.
Bark borers, 167.
Beans, insects injurious to:
Crepidodera cucumeris, 179.
leaf hopper, 182.
plant lice, 183.
Beech, insects injurious to:
Pemphigus imbricator, 135.
plant lice, 191.
Polygraphus rufipennis, 169.
Tremex columba, 171.
Beech, purple, insects injurious to:
Notolophus leucostigma, 191.
Phyllaphis fagi, 136, 191.
Seirodonta bilineata, 191.
Beech aphis, woolly, 136, 191.
Beechtree blight, 135-36.
Beets, Pegomyia vicina injuring, 185.
Beneficial insects, 97-125, 150-51, 194.
betulaecolens, Callipterus, 136.
bifoveolatum, Ophion, 114, 119-20, 121.
bilineata, Seirodonta, 191.
bilineatum, Ophion, *see* Ophion bilineatum.
bimaculata, Oberea, 178, 186.
bipunctata, Adalia, 136.
Birch, insects injurious to:
Agrilus anxius, 186.
Chrysobothris femorata, 171.
Dryocoetes eichhoffi, 171.
plant lice, 182.
Polygraphus rufipennis, 169.
Tremex columba, 171.
Birch, cut-leaved, Callipterus betulaecolens injuring, 136.
Birch aphis, 136.
Birch borer, bronze, 186.
Black flea beetle, 176, 179, 180, 181, 185, 189.
Black knot, 182.
Black lady beetle, little, 150-51.
Black woolly bear, 182.
Blackberry bushes, Oberea bimaculata injuring, 178, 186.
Blauvelt, Egbert, on Corythuca marmorata, 125, 129; on Lygus pratensis, 145.
Blauvelt, Harry, on Corythuca marmorata, 125.
Blennocampa pygmaea, 142.
Blepharoceridae, 199.
Bordeaux mixture, 199.
borealis, Dibolia, 181.
botrana, Polychrosis, 142-43.
Bowman, Thomas & Son, nursery certificate issued to, 95.
Box elder, insects injurious to:
Chaitophorus negundinis, 135, 183.
plant lice, 182.
Box elder plant louse, 135.
brassicae, Aphis, *see* Aphis brassicae.
brassicae, Phorbia, *see* Phorbia brassicae.
Bronze birch borer, 186.
Brown Bros. Co., nursery certificate issued to, 96.
Brown tail moth, 197.
Brown woolly bear, 182.
Bruchus pisorum, 194, 195.
Brullé, Auguste, cited, 103, 111, 120.
Bruner, Lawrence, cited, 101, 104.
brunneus, Rhyncolus, 170.
Bud moth, 177, 178, 183.

Bumble flower beetle, 190.
Buprestid, 6-spotted, 171.
Burdock, plant lice on, 182.
Poecilocapsus lineatus injuring, 179.
Butternut, Datana integerrima injuring, 183.

Cabbage, insects injurious to:
Aphis brassicae, 133, 180.
Phorbia brassicae, 143, 175, 179, 187, 192.
Cabbage aphis, 133-34, 175, 180.
Cabbage butterfly, 175, 176, 178, 180, 182, 183, 186.
Cabbage maggot, 143-44, 175, 179, 192.
Cabbage worm, 178, 187.
black-headed, 182.
calcarata, Saperda, 186.
calligraphus, Tomicus, 167, 193.
Callipterus betulaecolens, 136.
ulmifolii, 134.
Callosamia promethea, 102, 105.
candida, Saperda, 186.
Cankerworms, 179, 183, 184, 191.
Carbolic soap emulsion, 144.
Carbon bisulfid, 145.
cardinalis, Novius, 194.
Carpocapsa pomonella, 139, 183, 187, 191.
Carrot rust fly, 197.
caryae, Halisidota, 118.
Case-bearer, cigar, 179.
Cat flea, 145.
Cattaraugus county, summary of voluntary reports from, 174-76.
Caulfield, F. B., cited, 111.
Cayuga county, summary of voluntary reports from, 176.
Cecidomyia destructor, 178, 179, 183.
cecropia, Samia, 102.
Cedar birds, 186.
ceparum, Phorbia, 144, 187.
Cerambicid, 172.
cerasi, Myzus, *see* Myzus cerasi.
Ceratopsyllus serraticeps, 145-47.
Cetonia, Indian, 176.
Chaitophorus aceris, 134, 191.
negundinis, 135, 181, 183.
populicola, 136.
chalybea, Haltica, 142.
Chambers, V. T., cited, 104.
Charlton Nursery Co., certificate issued to, 95.
Chase Bros. Co., nursery certificate issued to, 96.
Chemung county, summary of voluntary reports from, 176-77.
Cherry aphis, 133, 188.
Cherry borers, 191.
Cherry slug, 186.
Cherrytree, insects injurious to:
cedar birds, 186.
Macrodactylus subspinosus, 178.
Myzus cerasi, 133, 175, 176, 177, 179, 180, 182, 185, 188-89.
Chilocorus similis, 93, 150, 194, 196, 200.
Chinese lady beetle, 93, 150, 194, 200.
Chironomidae, 93.
Chokecherrytrees, Malacosoma ? disstria injuring, 184.
Chrysanthemum lace bug, 125-29.
explanation of plate, 221.
Chrysobothris *sp.*, 170.
femorata, 171.
pusilla, 172.
scabripennis, 171, 172.
Chrysomelidae, aquatic, 199.
chrysorrhoea, Euproctis, 197.
Cigar case-bearer, 179.
Clarkson, Frederick, cited, 104.
Clisiocampa [Malacosoma] americana, 193.
disstria, 193.
Clover, Phytonomus punctatus injuring, 184.
Clover leaf weevil, 184.
Clymonts, T. S., on Polychrosis botrana, 142.
Coccidae, received in exchange, 201, 205-6; available for exchange, 213.
Codling moth, 139, 183, 187, 188, 191.
Coleophora fletcherella, 179.

Coleoptera, taken at Newport N. Y., 197; received in exchange, 202-3; available for exchange, 208-11; contributions of, 213-15.
Coleopterous larvae, 199.
Colias butterfly, 185.
Collections of insects, 94-95; contributions to, 213-20.
coloradensis, Genophion, 123, 124-25.
Colorado potato beetle, *see* Potato beetle.
columba, Tremex, 171.
columbia, Samia, 102.
comes *var.* vitis, Typhlocyba, 192.
Comstock, J. H., acknowledgments to, 97; cited, 101, 104, 125.
concinna, Schizura, 109.
confusor, Monohammus, 169, 193.
Conotrachelus nenuphar, 137, 175, 184.
Cook, M. T., acknowledgments to, 96.
Coquillett, D. W., cited, 104.
Corn, Crepidodera cucumeris injuring, 179.
Correspondence, 92.
Corythuca marmorata, 125-29.
explanation of plate, 221.
costale, Ophion, 114, 123.
Crandall, John R., on Diplotaxis liberta, 137.
Crane fly, 187.
Crepidodera cucumeris, 176, 179, 180-81, 185, 189.
Cresson, E. T., cited, 104, 107, 111, 116, 120, 123.
Crimson rambler rose, lady beetles on, 185.
Crioceris asparagi, 143, 176, 178, 179, 189, 190.
12-punctata, 190.
Cucumber beetle, striped, 177, 179, 180, 181, 185, 186, 187, 190, 191, 194.
Cucumber flea beetle, 176, 179, 180, 181, 185, 189.
Cucumber vines, Diabrotica vittata injuring, 179.
cucumeris, Crepidodera, *see* Crepidodera cucumeris.
Culicidae, 199; received in exchange, 203-4.
Curculio, plum, 137, 175, 184, 197.
Currant aphis, 180, 181.
Currant bushes, insects injurious to:
Myzus ribis, 181.
Poecilocapsus lineatus, 179.
sawfly, 181.
Currant worms, 176, 178, 180, 181, 184, 185-86, 187, 188.
Cutworms, 176, 177, 186, 189.
cyanea, Scutellista, 194.
cynthia, Philosamia, 102.

Daisy, Macrodactylus subspinosus injuring, 181.
Datana integerrima, 149, 183.
ministra, 182.
Davis, G. C., cited, 107, 118, 138.
Davis, K. C., cited, 93, 200.
decem-lineata, Doryphora, *see* Doryphora 10-lineata.
deflorata, Ecpantheria, 105.
Dendroctonus terebans, 193.
destructor, Cecidomyia, 178, 179, 183.
Diabrotica 12-punctata, 137.
harperi, 138.
vittata, 177, 179, 181, 185, 186, 187, 190, 194.
Diacrisia virginica, 105, 115.
Dibolia borealis, 181.
dimidiatus, Phymatodes, 171.
Diplosis pyrivora, 191.
Diplotaxis frondicola, 137.
liberta, 137.
Diptera, received in exchange, 203; available for exchange, 211; contributions of, 215-16.
Diseased and dying trees and insect attack, 167-73.
Diseases and pests, 196.
Disonycha triangularis, 181, 182.
disstria, Malacosoma, *see* Malacosoma disstria.
Dock, insects injuring, 181, 182.
Dog flea, 145.
domestica, Musca, 198.

Doryphora 10-lineata, 175, 176, 177, 178, 180, 184, 185, 187, 190, 192.
Dragon fly, 187.
Drepanosiphum acerifolii, 135, 181-82, 192.
Dryocoetes eichhoffi, 171.
duodecim-punctata, Diabrotica, 137.
Dust and other sprays, 195.
Dutchess county, summary of voluntary reports from, 177-78.

Ecpantheria deflorata, 105.
Eggplant, insects injurious to:
  Crepidodera cucumeris, 189.
  Diabrotica vittata, 187.
  plant lice, 187.
Ehrhorn, E. M., species received from, 201.
eichhoffi, Dryocoetes, 171.
Elm, insects injurious to:
  Callipterus ulmifolii, 134.
  Disonycha triangularis, 181, 182.
  Galerucella luteola, 147, 191.
  Hyphantria textor, 188.
  plant lice, 182, 187.
  Schizoneura americana, 181.
Elm aphis, 134-35.
Elm borer, 167.
Elm flea beetle, 181, 182.
Elm leaf beetle, 91, 134, 147, 174, 189, 190, 191, 195, 196.
Elm snout beetle, 167.
Emmons & Co., nursery certificate issued to, 96.
Eniscopilus, 101, 107.
  appendiculatus, 108, 113, 221.
  arcuatus, 108, 112-13.
    explanation of plate, 221.
  purgatus, 98, 100, 107, 108-11, 112.
Entomology, handbook, 193.
Epargyreus tityrus, 118.
Eremotylus, 101.
  arctiae, 100, 101, 102, 105-6, 107.
  glabratus, 101, 106-7.
  macrurus, 97, 99, 100, 101-4, 105, 106, 107, 221.
Erie county, summary of voluntary reports from, 178.
Eriocampoides limacina, 186.
Eulecanium juglandis, 141-42.
  tulipiferae, *see* Lecanium [Eulecanium] tulipiferae.
Euphoria inda, 176, 190.
Euproctis chrysorrhoea, 197.
Euvanessa antiopa, 180, 185, 186.
Evans, J. D., cited, 104, 111, 116.
Evergestis stramenalis, 182.
Exchanges, system of, 95, 200-13.
Explanation of plates, 221.

fagi, Phyllaphis, 136, 191.
Fall webworm, 92, 149, 177, 180, 182, 183, 188, 193.
Fallou, cited, 104.
Felt, E. P., Monograph of Genus Saperda, 94.
Feltia gladiaria, 115.
femorata, Chrysobothris, 171.
ferruginipennis, Ophion, 114, 122.
Fidia viticida, 92, 192, 193-94, 195, 196, 197, 198, 199.
First National Nurseries, certificate issued to, 96.
Flea beetle, black or cucumber, 176, 179, 180, 181, 185, 189.
Fleas, 145-47, 195.
Fletcher, James, cited, 111.
fletcherella, Coleophora, 179.
Flies, 175, 198.
  black, 199.
Forbes, S. A., cited, 101, 120.
Forest and shade trees, insects injurious to, 94.
Forest fires and insect attack, 168-69, 199.
Forest tent caterpillar, 149, 174, 177, 181, 183, 184, 193.
Forest trees, insects injurious to, 94, 147-49, 192.
frondicola, Diplotaxis, 137.
Fruit growers and truckers, hints to, 197.
Fruit growers association, work and observations in *1902*, 196.
Fruit tree bark beetle, 191, 200.
Fruit tree insects, 137-42.
fuliginipennis, Ophion, 102.
fulvoguttata, Melanophila, 171, 172.
Fyles, T. W., cited, 104.

Galerucella luteola, 91, 134, 147,174, 189, 190, 191, 195, 196.
Gall beetle, gouty, 178, 186.
Garden insects, 143-45.
Garman, H., species received from, 201.
Gartered plume moth, 189.
Genesee county, summary of voluntary reports from, 178-80.
Genophion, 101, 123.
coloradensis, 123, 124-25.
gilletti, 123-24.
Gillette, C. P., species received from, 201.
gilletti, Genophion, 123-24.
glabratus, Eremotylus, 101, 106-7.
gladiaria, Feltia, 115.
Glaea inulta, 115.
Gnathotricus materiarius, 170.
Gooseberries, Pteronus ribesii injuring, 176.
Gouty gall beetle, 178, 186.
Grain beetle, saw-toothed, 145.
Grain pests, 145-47.
Grapeberry moth, 142-43.
Grapevine, insects injurious to, 142-43, 178.
Grapevine leaf hopper, 192.
Grapevine root worm, 92, 94, 192, 193-94, 195, 196, 197, 198, 199.
Grapevine sawfly, 142.
Grasshoppers, 175, 176, 181, 182, 190.
Graves, George S., on Aphis brassicae, 133; on Chaitophorus negundinis, 135; on Drepanosiphum acerfolii, 135; on Pemphigus imbricator, 135; on Callipterus betulaecolens, 136.
Greene county, summary of voluntary reports from, 180.

Haemotobia serrata, 175, 181, 183.
Halisidota agassizii, 106.
caryae, 118.
Haltica chalybea, 142.
harperi, Diabrotica, 138.
Harrington, W. H., cited, 104, 111, 116.
Hart, W. H., experiments in controlling San José scale, 155.
Heliophila unipuncta, 109.
Hemiptera, received in exchange, 205; available for exchange, 212-13; contributions of, 217-19.
Hemlock, insects injurious to:
Melanophila fulvoguttata, 171, 172.
Polygraphus rufipennis, 169.
Xylotrechus undulatus, 172.
Herkimer county, summary of voluntary reports from, 180-83.
Hessian fly, 178, 179, 183, 185.
Horn flies, 175, 181, 183.
Hornets, 183.
Horse-chestnut trees, Notolophus leucostigma injuring, 92.
Horseflies, 175, 183.
House flies, 185, 190, 198.
House pests, 145-47.
Howard, L. O., acknowledgments to, 96, 105, 150; cited, 104, 106, 107, 111, 115, 116, 129, 137.
Hubbard, T. S. Co., nursery certificate issued to, 96.
Huested, P. L., experiments in controlling San José scale, 159.
Hunter, Prof., on number of plant lice, 130.
Hydrocyanic acid gas, 145, 146.
Hymenoptera, received in exchange, 201-2; available for exchange, 207; contributions of, 213.
Hyphantria cunea [textor], 193.
textor, 92, 149, 177, 180, 182, 183, 188.

imbricator, Pemphigus, 135-36.
inda, Euphoria, 176, 190.
Indian Cetonia, 176.
Injurious insects, 125-29; introduced from abroad, 196.
Insect exchange, 95, 200-13.
Insecticides, paper on, 94.
Insecticides and fungicides, 195.
Insecticides and notes, 194.
integerrima, Datana, 149, 183.
inulta, Glaea, 115.
io, Automeris, 102, 105.

isabella, Isia, 102.
Pyrrharctia, 182.
Isia isabella, 102.

Jack, J. G., cited, 101.
Johannsen, Oskar Augustus, cited, 93, 199, 200.
Josselyn, G. S. Co., nursery certificate issued to, 96.
Joutel, L. H., monograph of genus Saperda, 94.
juglandis, Eulecanium, 141-42.
June beetles, 138, 186, 190.

Kellogg, V. L., species received from, 201.
Kerosene emulsion, 132, 141, 144, 166.
Knight & Bostwick, nursery certificate issued to, 96.
Kridelbaugh, cited, 137.

Lacewing flies, 131.
Lachnosterna, 138.
Lady beetle, 131, 185, 190.
Chinese, 93, 150, 194, 200.
little black, 150-51.
spotted, 183.
two spotted, 136.
Lantern slides, added to collection, 92.
Leaf bug, four-lined, 179.
Leaf hopper, 182, 185.
Leaf miner, 185.
Lecanium ? pruinosum, 174.
[Eulecanium] tulipiferae, 199.
Legislation against pests, 194.
Lepidoptera, received in exchange, 204; available for exchange, 211-12; contributions of, 216-17.
Lepidosaphes ulmi, 195.
Leptura subhamata, 171.
leucostigma, Notolophus, *see* Notolophus leucostigma.
Lewis, H. D., on Psylla pyricola, 139.
libatrix, Scoliopteryx, 109.
liberta, Diplotaxis, 137.
Lights, value of for destroying insects, 97-98.
Lilacs, webworm injuring, 183.
Lima beans, Diabrotica vittata injuring, 181.
limacina, Eriocampoides, 186.
Lime, air slacked, 138.
Lime, salt and sulfur mixture, 194, 195, 196.
Lime-sulfur wash, 93, 141, 154-58, 159-60.
lineatus, Poecilocapsus, 179.
Xyloterus, 170, 172.
Lintner, J. A., cited, 100, 104, 106, 116.
London purple, 142, 149.
Looper caterpillar, 174, 194.
Lowe, V. H., experiments, 159; death of, 96.
Lugger, Otto, cited, 109, 111.
luteola, Galerucella, *see* Galerucella luteola.
Lygus pratensis, 144-45.

Mac Gillivray, A. D., cited, 93, 199, 200.
Macrodactylus subspinosus, 138, 175, 178, 181, 185, 186, 189, 198.
Macrurus, Eremotylus, *see* Eremotylus macrurus.
Magdalis armicollis, 167.
barbita, 167.
Maggots in mushrooms, 193.
Malacosoma americana, 138-39, 175, 176, 177, 178, 180, 183, 186, 188, 190, 191, 193.
disstria, 149, 174, 177, 181, 184, 193.
mali, Aphis, *see* Aphis mali.
Mamestra picta, 109, 189-90.
trifolii, 109.
Maple, insects injurious to:
Chaitophorus aceris, 191.
Drepanosiphum acerifolii, 135, 182, 192.
plant lice, 187, 191.
Polygraphus rufipennis, 169.
Psocus ? venosus, 182.
Sesia acerni, 200.
Tremex columba, 171.
Maple, ash-leaf, Chaitophorus negundinis injuring, 181.

Maple, soft, Apatela americana injuring, 183.
Maple aphis, 182.
Mapletree borers, 198.
Marlatt, C. L., cited, 101.
marmorata, Corythuca, 125-29.
materiarius, Gnathotricus, 170.
May beetles, 138, 175, 189.
May fly, 93, 187.
Meat fly, 183.
Mecoptera, available for exchange, 212.
Melanophila fulvoguttata, 171, 172.
Melon vines, Diabrotica vittata injuring, 179.
Midges, net-winged, 199.
ministra, Datana, 182.
misella, Pentilia, 150-51.
Monohammus confusor, 169, 193.
scutellatus, 169-70.
Morrell, L. L., experiments in controlling San José scale, 155.
Mosquitos, 93, 175, 187, 191, 198, 199.
Mount Hope Nurseries, nursery certificate issued to, 95.
Mountain ash, Diplotaxis frondicola injuring, 137.
Mourning cloak butterflies, 185, 186.
Musca domestica, 198.
Mushrooms, maggots in, 193.
Myriapoda, contributions of, 220.
Mytilaspis pomorum, 195.
Myzus cerasi, 133, 175, 177, 185, 186, 188.
ribis, 180, 181, 186.

Nasturtiums, Pieris rapae injuring, 183.
Needham, James G., cited, 93, 200; report on May flies and midges, 93.
negundinis, Chaitophorus, 135, 181, 183.
Nellis, J. B., & Co., nursery certificate issued to, 96.
nenuphar, Conotrachelus, 137, 175, 184.
Neuroptera, received in exchange, 204; contributions of, 217.
New York entomologic service, 196, 197, 198, 199.
New York plum scale, 141-42.
nigrovarium, Ophion, 114, 121.
nitela, Papaipema, 190.
Norton, Edward, cited, 100, 103, 107, 111, 116, 120.
Norway maple, Chaitophorus aceris injuring, 134.
Notes for the year, 130-51.
Notolophus leucostigma, 91, 115, 147-49, 187, 191.
Novius cardinalis, 194.
Nursery inspection work, 95-96; efficacy, 194.

Oaks, insects injurious to, 94.
Oats, white grubs injuring, 187.
Oberea bimaculata, 178, 186.
ocellana, Tmetocera, 177, 178, 183.
Office work, 92.
Onion, Phorbia ceparum injuring, 144, 187.
Onion maggot, 144, 187.
Onondaga county, summary of voluntary reports from, 183-85.
Ophion, 101, 113.
long-tailed, 97, 101-4.
two-lined, 98, 114.
Ophion abnormum, 114, 121-22, 221.
bifoveolatum, 114, 119-20, 121, 221.
bilineatum, 98, 107, 113, 114-16, 117, 118, 119, 221.
coloradensis, 123.
costale, 114, 123.
ferruginipennis, 114, 122, 221.
fuliginipennis, 102.
glabratum, 106.
nigrovarium, 114, 121.
purgatus, *see* Eniscopilus.
tityri, 98, 113, 116-19, 122, 124.
Ophionid wings, explanation of plate, 221.
Ophionini, value as parasites, 97-98; synopsis of certain genera, 97-125; general habits, 98-99; oviposition and larval habits, 99-100; pupation and final transformations, 100.

Orange county, summary of voluntary reports from, 185-86.
Orthoptera, received in exchange, 207; contributions of, 219.
Osborn, Herbert, cited, 104, 111, 116, 120; species received from, 201.
Oxyptilus periscelidactylus, 189.

Packard, A. S., cited, 100, 103, 109, 111, 116, 119.
Panton, cited, 111.
Papaipema nitela, 190.
Parasites, synopsis of certain genera of the Ophionini, 97-125.
Paris green, 142, 149.
Pea weevil, 194, 195.
Peachtree, Diplotaxis liberta injuring, 137.
Pear midge, 191.
Pear psylla, 139-40, 177, 178, 180, 189, 200.
Pear slug, 186.
Peartree, insects injurious to:
  Eriocampoides limacina, 186.
  Psylla pyricola, 139, 178, 189, 200.
  Scolytus rugulosus, 200.
Peartree, Bosc, green plant louse injuring, 188.
Peas, insects injuring, 185.
Peck, H. C., acknowledgments to, 95.
Pegomyia vicina, 185.
Pemphigus imbricator, 135-36.
  popularius, 136.
Pentilia misella, 150-51.
Peppermint, Poecilocapsus lineatus injuring, 179.
periscelidactylus, Oxyptilus, 189.
Perkins, G. H., cited, 104, 116.
perniciosus, Aspidiotus, *see* Aspidiotus perniciosus.
Perry Nursery Co., nursery certificate issued to, 96.
Petroleum, crude, 153, 193, 195, 196.
Petroleum emulsion, 151-54, 158, 159, 166, 192, 194.
Pettis, C. R., on Pemphigus popularius, 136.
Philosamia cynthia, 102.
phlaeocoptes, Phytoptus, 142.
Phlegethontius 5-maculatus, 176, 187.
Phora agarici, 193.
Phorbia brassicae, 143-44, 175, 179, 187, 192.
  ceparum, 144, 187.
Phyllaphis fagi, 136, 191.
Phymatodes dimidiatus, 171.
Phytonomus punctatus, 184.
Phytoptus phlaeocoptes, 142.
picta, Mamestra, 109, 189-90.
Pieris rapae, 175, 176, 178, 180, 182, 183, 186.
Pigeon tremex, 171.
Pigweed, plant lice on, 182, 183.
Pine, insects injurious to: 94, 193.
  bark borers, 167.
  Monohammus confusor, 169.
  Polygraphus rufipennis, 169.
  Rhyncolus brunneus, 170.
  Tomicus pini, 169.
Pine bark borer, 169.
Pine sawyer, 169.
pini, Tomicus, *see* Tomicus pini.
pisorum, Bruchus, 194, 195.
Plagionotus speciosus, 198.
Plant lice, 91, 130-36, 173, 175, 176, 177, 179, 180, 181, 182, 183, 185, 186, 187, 188, 189, 190, 191, 192, 198, 199.
  green, 184, 188.
Plantains, Crepidodera cucumeris injuring, 181.
Plates, explanation of, 221.
Plecoptera, received in exchange, 207; contributions of, 217.
Plum curculio, 137, 175, 184, 197.
Plum mite, 142.
Plumtree, insects injurious to:
  Aphis mali, 182.
  Diabrotica 12-punctata, 138.
  Eulecanium juglandis, 141.
  Hyphantria textor, 188.
  Phytoptus phlaeocoptes, 142.
  plant lice, 176, 179, 187.
Plumtree, wild, Diplotaxis frondicola injuring, 137.
Poecilocapsus lineatus, 179.
Polychrosis botrana, 142-43.
Polygraphus rufipennis, 169, 170.

polyphemus, Telea, 102, 109.
pomonella, Carpocapsa, *see* Carpocapsa pomonella.
pomorum, Mytilaspis, 195.
Popenoe, E. A., species received from, 201.
Poplar, insects injurious to:
Agrilus anxius,186.
Euvanessa antiopa, 186.
Saperda calcarata, 186.
Xyleborus *sp.*, 172.
poplar borer, 186.
popularius, Pemphigus, 136.
populicola, Chaitophorus, 136.
Populus balsamiferus, 136.
Potato beetle, 175, 176, 177, 178, 180, 181, 182, 184, 185, 187, 188, 189, 190, 191, 192, 199.
Potato wireworms, 193.
Potatoes, insects injurious to:
Crepidodera cucumeris, 176, 179, 181, 185, 189.
Doryphora 10-lineata, 175, 176, 177, 178, 180, 184, 185, 187, 190, 192.
Potatoes, spray for, 199.
pratensis, Lygus, 144-45.
promethea, Callosamia, 102, 105.
Provancher, *L'Abbé* L., cited, 100, 104, 111, 116, 120.
? pruinosum, Lecanium, 174.
Psila rosae, 197.
Psocus ? venosus, 182.
Psyche, extract from, 112.
Psylla pyricola, 139-40, 177, 180, 189, 200.
Pteronus ribesii, 176, 178, 180, 184, 186, 188.
Publications of entomologist, 93-94, 192-200.
Pumpkins, Diabrotica vittata injuring, 185.
punctatus, Phytonomus, 184.
purgatus, Eniscopilus, *see* Eniscopilus purgatus.
Purple beech, Phyllaphis fagi injuring, 136.
pusilla, Chrysobothris, 172.
pygmaea, Blennocampa, 142.
pyricola, Psylla, *see* Psylla pyricola.
pyrivora, Diplosis, 191.
Pyrrharctia isabella, 182.

Quinces, plant lice injuring, 132, 179.
quinquemaculatus, Phlegethontius, 176, 187.

rapae, Pieris, *see* Pieris rapae.
Red admiral butterflies, 184.
Red spider, 189.
Remedies and preventives for:
appletree plant louse, 132.
asparagus beetle, 197.
cabbage maggot, 144.
Chaitophorus aceris, 134.
cherry plant louse, 133.
chrysanthemum lace bug, 129.
Diplotaxis liberta, 138.
fall webworm, 149.
fleas, 146, 195.
fruit tree bark beetle, 200.
grapeberry moth, 142.
grapevine root worm, 92, 194, 197, 198, 199.
grapevine sawfly, 142.
maggots in mushrooms, 193.
New York plum scale, 141.
pear psylla, 140.
plant lice, 132, 133, 134, 190, 198, 199.
plum curculio, 137, 197.
potato beetles, 199.
San José scale, 93, 151-66, 192, 193, 194, 196, 197.
saw-toothed grain beetle, 145.
Sesia acerni, 200.
steely flea beetle, 142.
tarnished plant bug, 145.
tussock moth, white marked, 148-49.
Remedies and preventives for insect depredations:
arsenate of lead, 142, 148, 194, 195, 196, 199.
arsenical poison, 137.
bands of tar or cotton, 148.
bordeaux mixture, 199.
carbolic soap emulsion, 144.

Remedies etc. (*continued*)
carbon bisulfid, 145.
dust and other sprays, 195.
hydrocyanic acid gas, 145, 146.
kerosene emulsion, 132, 141, 144, 166.
lime, air slacked, 138.
lime, salt and sulfur, 194, 195, 196.
lime-sulfur wash, 141, 154-58, 159-66.
london purple, 142, 149.
paris green, 142, 149.
petroleum, crude, 153, 193, 195, 196.
petroleum emulsion, 151-54, 158, 159, 166, 192, 194.
tobacco water, 132.
whale oil soap, 129, 132, 134, 140, 141, 145, 158, 166, 190, 192, 194, 195, 196.
wood ashes, 138.
Report of state entomologist, 197.
Rhopalosiphum solani, 185.
Rhyncolus brunneus, 170.
ribesii, Pteronus, *see* Pteronus ribesii.
ribis, Myzus, 180, 181, 186.
Riley, C. V., cited, 100, 101, 102, 103-4, 106, 107, 111, 116, 120, 137.
Rockland county, summary of voluntary reports from, 186.
Roesch, Lewis, nursery certificate issued to, 96.
Rogers Nursery, certificate issued to, 96.
rosae, Psila, 197.
Rose, J. F., on plant lice, 132; on Aphis brassicae, 133.
Rose beetle, 138, 175, 178, 181, 185, 186, 189, 198.
Rose slugs, 187.
Rosebushes, insects injurious to:
Diplotaxis frondicola, 137.
leaf hoppers, 185.
Macrodactylus subspinosus, 175, 181, 185.
Myzus cerasi, 185.
plant lice, 182, 184, 185, 189, 190.
Rosebushes etc. (*continued*)
Tetranychus telarius, 189.
rufipennis, Polygraphus, 169, 170.
rugulosus, Scolytus, 191.

Sage, Poecilocapsus lineatus injuring, 179.
St Lawrence county, summary of voluntary reports from, 186-88.
Samia cecropia, 102.
columbia, 102.
San José scale, 91, 93, 140-41, 150, 151-66, 192, 193, 194, 195, 196, 197.
Sanborn, F. G., cited, 103, 116.
Sanders, J. G., species received from, 201.
Saperda, monograph of genus, 94.
calcarata, 186.
candida, 186.
tridentata, 167.
Saratoga county, summary of voluntary reports from, 188.
Saunders, William, cited, 104, 116.
Saw-toothed grain beetle, 145.
Sawfly, 181, 188.
Say, Thomas, cited, 107, 111, 116.
scabripennis, Chrysobothris, 171, 172.
Scale insects, 194; determinations of, 92; soft, 174.
Schenectady county, summary of voluntary reports from, 188.
Schizoneura americana, 181.
Schizura concinna, 109.
unicornis, 109.
Schuyler county, summary of voluntary reports from, 188.
Sciara *sp.*, 193.
Scoliopteryx libatrix, 109.
Scolytus rugulosus, 191, 200.
Scudder, S. H., cited, 103, 116, 119.
scutellatus, Monohammus, 169-70.
Scutellista cyanea, 194.
Seirodonta bilineata, 191.
serrata, Haemotobia, 175, 181, 183.
Sesia acerni, 200.
Shad flies, 187.
Shade tree ratings, 195.

Shade trees, injurious insects, 94, 147-49.
Sheeren Wholesale Nurseries, certificates issued to, 95-96.
Sialididae, 200.
signatus, ?Anthonomus, 187.
Silvanus surinamensis, 145.
similis, Chilocorus, *see* Chilocorus similis.
Simuliidae, 199.
Siphonaptera, contributions of, 215.
Sirrine, F. A., on Phorbia brassicae, 144.
Slosson, A. T., cited, 120.
Smith, J. B., cited, 101, 103, 104, 107, 111, 116, 120; acknowledgments to, 113.
Snow, F. H., species received from, 201.
solani, Rhopalosiphum, 185.
Special investigations, 92-93.
speciosus, Plagionotus, 198.
Spiny elm caterpillar, 186.
Spittle insects, 181, 185.
Spraying, 195. *See also* Remedies.
Spruce, insects injurious to:
Chrysobothris *sp.*, 170.
Chrysobothris scabripennis, 171.
Gnathotricus materiarius, 170.
Phymatodes dimidiatus, 171.
Polygraphus rufipennis, 169, 170.
Xyloterus lineatus, 170.
Xylotrechus undulatus, 171.
Spruce bark beetle, 169, 170.
Squash bug, 175, 177, 180, 185, 189.
Squash vines, insects injurious to:
Anasa tristis, 175, 177, 180, 189.
Diabrotica vittata, 179.
Stalk borer, 190.
Steely flea beetle, 142.
stramenalis, Evergestis, 182.
Strawberry plants, insects injurious to:
Diabrotica harperi, 138.
Mamestra picta, 190.
Strawberry weevil, 187.
Stuart, C. W., & Co., nursery certificate issued to, 96.
subhamata, Leptura, 171.
subspinosus, Macrodactylus, *see* Macrodactylus subspinosus.
Summer washes, 159-66.
Sunflowers, plant lice injuring, 183.
surinamensis, Silvanus, 145.
Sweet, George A., Nursery Co., certificate issued to, 96.
Symmerista albifrons, 118.
Syrphus flies, 131.

Tamarack, insects injurious to:
Leptura subhamata, 171.
Polygraphus rufipennis, 169.
Tomicus pini, 171.
Tarnished plant bug, 144-45.
Taylor, H. S., & Co., nursery certificate issued to, 95.
telarius, Tetranychus, 189.
Telea polyphemus, 102, 109.
terebans, Dendroctonus, 193.
Tetranychus telarius, 189.
textor, Hyphantria, *see* Hyphantria textor.
Thorn apple, Macrodactylus subspinosus injuring, 181.
Thysanura, contributions of, 219.
Timothy, Pyrrharctia isabella injuring, 183.
Tingis arcuata, 128.
tityri, Ophion, *see* Ophion tityri.
tityrus, Epargyreus, 118.
Tmetocera ocellana, 177, 178, 183.
Tobacco water, 132.
Tobacco worm, 176.
Tomato worm, 187.
Tomatoes, insects injurious to:
Crepidodera cucumeris, 179, 181, 185, 189.
Rhopalosiphum solani, 185.
Tomicus calligraphus, 167, 193.
pini, 167, 169, 171, 193.
torrefacta, Apatelodes, 102.
Trap lantern records, 108, 114, 117, 120.
Tremex columba, 171.
Triangularis, Disonycha, 181, 182.
Trichoptera, available for exchange, 212; contributions of, 217.
tridentata, Saperda, 167.
trifolii, Mamestra, 109.

tristis, Anasa, *see* Anasa tristis.
Trouvelet, cited, 99, 103.
Trumpet vine, Lecanium ? pruinosum injuring, 174.
Tulip tree scale, 199.
Turnips, insects injurious to:
Aphis brassicae, 133, 182.
Evergestis stramenalis, 182.
Phorbia brassicae, 192.
Tussock moth, white-marked, 91, 147-49, 187, 191.
Typhlocyba comes *var.* vitis, 192.

Uhler, P. H., cited, 129.
ulmi, Lepidosaphes, 195.
ulmifolii, Callipterus, 134.
Ulster county, summary of voluntary reports from, 188-89.
undulatus, Xylotrechus, 171, 172.
unicornis, Schizura, 109.
unipuncta, Heliophila, 109.

Van Alstyne, Edward, experiments in controlling San José scale, 155.
Van Duzee, E. P., acknowledgments to, 96.
Vanessa atalanta, 184.
? venosus, Psocus, 182.
vicina, Pegomyia, 185.
virginica, Diacrisia, 105, 115.
viticida, Fidia, *see* Fidia viticida.
vittata, Diabrotica, *see* Diabrotica vittata.
Voluntary entomologic service of New York state, 96, 173-92.

Walker, C. M., determinations of scale insects, 92; experiments with summer washes, 93; experiments with lime-sulfur wash, 160-66; arrangement of collections, 94; nursery inspection work, 95.
Walnut trees, black, Datana integerrima injuring, 149.
Walnut worm, 149.
Warren county, summary of voluntary reports from, 189-90.
Waterhouse, cited, 104.
Wayne county, summary of voluntary reports from, 190.
Webster, F. M., cited, 101, 111.
Webworm, fall, 92, 149, 177, 180, 182, 183, 188, 193.
Weed, C. M., cited, 102, 104.
Westchester county, summary of voluntary reports from, 190-91.
Western New York Nursery Co., nursery certificate issued to, 95.
Whale oil soap, 129, 132, 134, 140, 141, 145, 158, 166, 190, 192, 194, 195, 196.
Wheat, Diabrotica harperi injuring, 138.
White grubs, 187.
Williams, C. L., on Crioceris asparagi, 143.
Williston, S. W., determinations by, 201.
Wood, A. L., nursery certificate issued to, 95.
Wood, Albert, on Psylla pyricola, 140.
Wood ashes, 138.
Woolly bear, black, 182.
brown, 182.
Woolly beech aphis, 136, 191.
Worthington, C. E., cited, 104.
Wyoming county, summary of voluntary reports from, 191-92.

Xyleborus *sp.*, 172.
Xyloterus lineatus, 170, 172.
Xylotrechus undulatus, 171, 172.

Young, D. B., investigations on mosquitos, 93; work on forest insects, 94; work on collections, 94-95; on Drepanosiphum acerifolii, 135; on Callipterus betulaecolens, 136; investigations on forest fires and insect attack, 168-69.

Zebra caterpillar, 109, 189.

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New York State Museum

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