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NINTH REPORT

ON THE

INJURIOUS AND OTHER INSECTS

OF THE

STATE OF NEW YORK

FOR THE YEAR 1892

[From the Forty-sixth Report on the New York State Museum]

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BY J. A. LINTNER, Ph. D., STATE ENTOMOLOGIST

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ALBANY

UNIVERSITY OF THE STATE OF NEW YORK

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# CONTENTS.

|  | PAGE. |
|--|-------|
| TRANSMITTAL .....  | 293   |
| GENERAL NOTES FOR THE YEAR.....  | 295   |
| INJURIOUS INSECTS :  |       |
| Anthrenus scrophulariæ and Attagenus piceus, two Carpet Beetles....          | 299   |
| Tenebrio obscurus ( <i>Fabr.</i> )—The American Meal-worm.....               | 307   |
| Pollenia rudis ( <i>Fabr.</i> )—The Cluster Fly .....                        | 309   |
| Murgantia histrionica ( <i>Hahn.</i> )—The Harlequin Cabbage-bug.....        | 315   |
| Psylla pyricola ( <i>Foerster</i> )—The Pear-tree Psylla .....               | 317   |
| Chortophaga viridifasciata ( <i>De Geer</i> )—The Green-striped Locust ..... | 330   |
| NOTES ON VARIOUS INSECTS, etc.   |       |
| Eriocampa cerasi ( <i>Peck</i> )—The Cherry-tree or Pear-tree Slug.....      | 335   |
| Papilio Cresphontes ( <i>Cramer</i> )—The Yellow-banded Swallow-tail.....    | 336   |
| Podosesia syringæ ( <i>Harris</i> )—The Syringa Borer.....                   | 338   |
| Carpocapsa pomonella ( <i>Linn.</i> )—The Codling Moth .....                 | 338   |
| Dynastes Tityus ( <i>Linn.</i> ), as a Fruit-eater .....                     | 342   |
| Crioceris asparagi ( <i>Linn.</i> )—The Asparagus Beetle .....               | 342   |
| Systema frontalis ( <i>Fabr.</i> )—Injuring Gooseberry Foliage.....          | 343   |
| Chauliognathus Pennsylvanicus, the Pennsylvania Soldier-Beetle.....          | 344   |
| Pissodes strobi ( <i>Peck</i> )—The White-pine Weevil .....                  | 344   |
| Myzus cerasi ( <i>Fabr.</i> )—The Cherry-tree Aphis .....                    | 345   |
| Pemphigus tessellata ( <i>Fitch</i> )—The Alder-blight Aphis.....            | 346   |
| Phylloxera vitifoliæ ( <i>Fitch</i> )—The Grapevine Phylloxera .....         | 347   |
| Crangonyx mucronatus ( <i>Forbes</i> ), a Blind Shrimp in Wells.....         | 347   |
| Insectivorous Birds for Protection.....                                      | 349   |
| INSECT ATTACKS :   |       |
| Resistance of Fleas to Insecticides.....                                     | 352   |
| White Grubs Injuring Nursery Stock .....                                     | 353   |
| The White Grub Eaten by the Robin .....                                      | 356   |
| A Maple-tree Pruner, Elaphidion parallelum <i>Newm.</i> .....                | 357   |
| The Striped Cucumber beetle, Diabrotica vittata ( <i>Fabr.</i> ).....        | 361   |
| The Grape Curculio, Craponius inæqualis ( <i>Say</i> ) .....                 | 364   |

| INSECT ATTACKS — ( <i>Continued</i> ):   | PAGE. |
|--|-------|
| The Peach-bark Scolytus, <i>Phloeotribus liminaris</i> ( <i>Harris</i> ) ..... | 365   |
| An Unrecognized Attack on Pease .....  | 368   |
| The Plum-tree Aphis, and the Brown Rot.....                                    | 368   |
| The Currant Aphis, <i>Myzus ribis</i> ( <i>Linn.</i> ).....                    | 370   |
| Aphides and Myriapods as Aster and Lily Pests.....                             | 371   |
| Some Apple-tree Insects.....   | 372   |
| Beet Insects .....   | 374   |
| Diseased Austrian Pines.....   | 376   |

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 APPENDIX.

|   |     |
|---|-----|
| (A) CATALOGUE OF THE KNOWN HOMOPTERA OF THE STATE OF NEW YORK<br>IN 1851..... | 381 |
| (B) ENTOMOLOGICAL ADDRESSES.....  | 414 |
| (C) LIST OF PUBLICATIONS OF THE ENTOMOLOGIST .....                            | 439 |
| (D) PUBLICATIONS OF THE ENTOMOLOGIST DURING THE YEARS 1870-1874..             | 446 |
| (E) CONTRIBUTIONS TO THE DEPARTMENT.....                                      | 461 |
| (F) CLASSIFIED LIST OF INSECTS NOTICED IN THIS REPORT.....                    | 465 |
| GENERAL INDEX.....  | 467 |

# R E P O R T .

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OFFICE OF THE STATE ENTOMOLOGIST, }  
ALBANY, December 10th, 1892. }

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

GENTLEMEN.—I have the honor of presenting to your Board my Ninth Report on the Injurious and Other Insects of the State of New York, embracing some of the studies and observations of my department during the current year.

The year has been one of remarkable exemption from insect injuries, as the result, beyond question, of meteorological conditions unfavorable to the multiplication of our more common insect pests. This has been particularly noticeable in the very few complaints that have been received of injuries to fruits—certainly not one-fifth of the average of preceding years. While this, in part, may be ascribed to the better knowledge of methods of dealing with the enemies of fruits to which our fruit-growers are becoming educated, and to the rapidly growing use of insecticides and spraying implements, certain it is that several of our more noxious insects, which almost annually are the cause of serious injury, did not present themselves in sufficient number to call for active operations against them. Thus, apple trees for the most part, escaped their customary early spring visitation of the aphid, *Aphis mali*. The cherry-tree aphid, *Myzus cerasi*, was not prevalent. The orchard tent-caterpillar, *Clisiocampa Americana*, was far less abundant than in preceding years. Not a single communication came to me relating to the operations of the eye-spotted bud-moth, *Imetocera ocellana*, which had been exceedingly destructive in 1891, and a general cause of complaint from the orchardists of Western New York. The pear-tree Psylla, *Psylla pyricola*, which threatened, in its excessive increase, to extend its destruction to pear trees in the Hudson river valley to other portions of the State, has not, during the past season, inflicted any appreciable harm.

No very severe attacks have been reported to me upon either garden or field crops. No complaint has reached me of injury to any of our grains from the grain aphid, *Siphonophora avenæ*, although again appearing in Columbia county, nor did the hop-vine aphid, *Phorodon humuli*, very materially affect the yield of our hop yards. The year has further been an exceptional one in that no new insect pest of marked economic importance has come under my notice calling for special investigation. Several of the minor attacks to which my attention has been drawn, will be noticed in the "Notes for the Year," to follow.

It was hoped that time would have been found to enable me to complete for publication some studies commenced in former years, but this has been prevented by a serious and protracted illness. I have also reason to regret that owing to this illness, I was compelled to cancel a number of engagements for addressing the farmers and fruit-growers of our State and scientific bodies, during the winter months. While the work of this Department would be largely extended and promoted by attendance at such meetings, it would at the same time make ample returns to your entomologist in information that he could not as well obtain through any other means.

The addition to the State Collection for the year has been over 2,500 specimens. Memoranda commenced on April 1st, show the number of specimens collected by me, 2,419. Of these 2,323 have been labeled and 1,411 mounted.

The Contributors to the Collection number fifty-three. A list of their contributions is appended to this Report. The customary list of the publications of the entomologist during the year, embracing thirty-three titles, accompanied with brief summaries of contents, will also be found in the Appendix.

The additional room and cases for which arrangements had been made, as stated in my report for 1891, have not yet been provided. This want has interfered with and impeded work which has been commenced in the classification of the biological material, both dry and in alcohol, and which is not at present conveniently accessible for reference or for study.

Respectfully submitted.

J. A. LINTNER.

## GENERAL NOTES FOR THE YEAR.

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In the absence of any serious outbreak of insect injury during the year, the following notes on some of the more common species that are with us in greater or less abundance annually, may be put on record.

The fall tent-caterpillar, *Hyphantria cunea* (Drury), has been noticeably abundant in various parts of the State—in Oswego county and elsewhere.

The injury to the foliage of the elm and horse-chestnut trees on the streets of Albany by the caterpillar of the white-marked tussock-moth, *Orgyia leucostigma* (Sm.-Abb.), which has been remarked upon in preceding reports, was again quite serious during the past summer. The falling to the pavement of the tips of the elm twigs, consequent on the girdling of the stem by the young larvæ for food, was not nearly as abundant as that noticed in 1883 (see *Second Report on the Insects of New York*) and in some subsequent years, nor was the insect so generally distributed throughout the city. But in certain localities, at about the time of cocoon spinning, the caterpillars could be seen by hundreds on the sidewalls of corner houses, as upon my own residence shaded by several large elms. A row of tall elms opposite had the foliage so severely eaten during the months of June and July as no longer to serve the purpose of shade, and not to be recognizable as elms at a short distance from them. Several horse-chestnut trees in the vicinity were entirely defoliated, except that portions of the larger ribs were left uneaten.

The *Dryocampa rubicunda* (Fabr.) caterpillar very seldom appears in harmful numbers in New York or the eastern States, but an exceptional occurrence of it was reported from Monticello, Sullivan county, N. Y., on the grounds of Mr. John D. Lyons, where a number of soft maple trees, which had been set out by him a few years, before, were completely defoliated by it during the summer. In several of the western States, as notably in Kansas, Missouri, and Nebraska, the soft maples planted as shade trees in cities are annually almost stripped of their foliage.\*

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\* Bulletin No. 14, vol. iii, 1890, of the Agricultural Experiment Station of Nebraska, pp. 54-59.

The cabbage Plusia, *Plusia brassicæ* (Riley), which is so great a pest to cabbage growers in the southern States, but is by no means common in the State of New York (see *Second Report on the Insects of New York*), has been complained of as giving much trouble in a greenhouse at Garden City, L. I., N. Y. Rev. Dr. Cox has written of it: "The caterpillar specially affects young parsley, but will also feed continuously on heliotrope, pelargium, and, in fact, on almost any green thing."

The canker-worm, *Anisopteryx vernata* (Peck), was so abundant in some orchards in Monroe county as to have nearly destroyed the foliage. Orchards in Cooperstown, Otsego county, were so despoiled by the caterpillars as to present the appearance of having been scorched and shriveled by fire.

The apple-worm of the codling-moth, *Garpocapsa pomonella*, was less injurious than usual throughout most of the State. An extensive fruit-grower and nurseryman of Rochester has written me of it: "Codling-moths in our orchards were almost extinct, it being difficult to find an apple with the larva or its burrows in it. I can not account for this, as ordinarily they are very abundant with us."

Although I have stated that nothing had been reported to me of injuries from the eye-spotted bud-moth, *Tmetocera ocellana* (Schiff.), during the year, I have since learned, on special inquiry, that it has been continuing its ravages in Western New York, without diminution, but rather on the increase, and that it threatens to become a permanent pest.

The cow-horn fly, *Hæmatobia serrata* R. Desv., the introduction of which into New York was announced in my preceding report, has during the year become generally distributed over the State. It is known to me to occur in forty-four of the sixty counties, and with scarcely a doubt is present in each one. The rapidity with which this insect has spread throughout the country is almost, or quite, without a parallel in the histories of our imported pests. First known in the United States only six years ago, it has at the present time become an annoying pest to cattle in New England, Florida, Mississippi, Kansas, and many of the intermediate States, and in Canada from the western part of the Province almost to Quebec.

Severe injuries to potatoes and to strawberry plants from the white grub of, probably, *Lachnosterna fusca* (Fröhl.), were reported from Cattaraugus county. Examples, for identification, of *Lachnosterna tristis* (Fabr.) were received from Mr. J. S. Smart, of Cambridge,

Washington county, which had appeared in large companies in the month of May in localities in the neighborhood and devoured the foliage of trees, showing a preference for the sugar maples.

The elm-tree beetle, *Galerucella Xanthomelena* (Schr.), or *G. luteola* Mull., as we may, in obedience to the law of priority be obliged to call it, has not, so far as we know, reached Albany in its steady northward progress. It is said to have done much damage to elms in Dutchess county in June.

One of the Chrysomelid flea-beetles, *Systema frontalis* (Fabr.), was observed as quite destructive to the foliage of the gooseberry at the Geneva Agricultural Experiment Station, early in August. It is believed that this is the first time it has been found to attack the gooseberry.

The Colorado potato beetle, *Doryphora decemlineata* (Say), although twenty years have passed since it first entered the State of New York, is still continuing with us,—less abundantly in some years than in others, but always in sufficient numbers to call for protection from its destructiveness by the use of Paris green or London purple. Spraying or sprinkling the vines with one of the arsenites is now quite generally practiced throughout the State. During the year it has been reported as doing much damage in Chautauqua and Albany counties, but perhaps not greater than in other counties where no mention of its injuries has been made. In its progress northwardly the insect has reached Prince Edward Island, in the Gulf of St. Lawrence, north latitude  $46\frac{1}{2}$  degrees, and has caused great damage to the potato crop the present year.

The plum curculio, *Conotrachelus nenuphar* (Herbst), was quite harmful to plums in Orange and other of the Hudson river counties, and in Monroe county about Rochester.

The little Curculionid beetle, *Otiorynchus ovatus* (Linn.), for some unexplained reason, frequently intrudes in large numbers in dwelling-houses. In August, examples for name were received from Moriches, Long Island, where they were infesting a house to the extent of being an annoyance to the household. For notice of some similar occurrences see my 2d Report, page 51, 4th Report, page 14, and 6th Report, page 107; also *Insect Life*, v, page 46. The insect is known to be very destructive to the plants that it attacks, but as it is strictly phytophagic, no fear need be entertained of injury from its presence in houses.

The grass crop was materially injured in some of the western counties of the State by an unusual number of "grasshoppers" (locusts), probably *Melanoplus femur-rubrum* (De Geer), and allied species.

Some alarm was excited in portions of Columbia county by an early appearance of multitudes of young "grasshoppers" while snow was yet on the ground. It was feared that their abundance at this time betokened an excessive multiplication as the season advanced. The insect, from examples received, was ascertained to be the young of "the green-striped locust," *Chortophaga viridifasciata* (De Geer). A notice of it and of its occasional winter appearances is contained in this report.

As a possible addition to the faunal list of our drinking waters may be named a species of *Ephemera* — one of the "day-flies." Several examples of it were received in April from Professor G. C. Hodges, of the Utica Academy, with the information that they had been taken from a water-filter in Utica. From a notice contained in the Utica Observer of April 25th, it appears that the filter was one that was connected with a fountain on a lawn. The little orifices through which the water escaped having become clogged, the cap was taken off, and, on examination, a large accumulation of the May-fly larvæ was found. Two days thereafter the same trouble recurred, and with the same results. Some of the larvæ were sent to Washington for comparison, where they were identified as, in all probability, belonging to the genus *Ephemera*, but as there were no named larvæ of the family *Ephemeridæ* in the collections of the National Museum, no more definite determination could be made.

Among other living forms which in previous years have come under my observation as having been drawn from water-faucets in dwelling-houses in Albany where their occurrence might have been inconvenient if not dangerous, are examples of *Gordius*, or the so-called "hair-snake," a blood leach of considerable size, and a specimen of the large intestinal worm, *Ascaris lumbricoides* with several inches in convoluted form of its extruded ovaries crowded with its countless eggs (now in the collection of the New York State Museum).

## INJURIOUS INSECTS.

**Anthrenus scrophulariæ** (Linn): **Attagenus piceus** (Oliv.).

*Two Carpet Beetles.*

(Ord. COLEOPTERA: Fam. DERMESTIDÆ.)

- LINNÆUS: Faun. Suec., 1761, p. 429 (*Dermestes*); Syst. Nat., 1767, i, pars ii, p. 568. 1 (*Byrrhus*).
- FABRICIUS: Syst. Ent., 1775, p. 61. 2; Spec. Ins., i, 1781, p. 70. 2; Mant. Ins., i, 1787, p. 39. 2 (*Dermestes*); Syst. Eleuth., 1801, p. 107.
- LAMARCK: Hist. Nat. An. Sans. Vert., iv, 1835, p. 724.
- MELSHEIMER: in Proc. Acad. Nat. Sci. Phil., ii, 1844, p. 117 (describes *A. thoracicus*, now regarded as a variety of *A. scrophulariæ*).
- LECONTE: in Proc. Acad. Nat. Sci. Phil., vii, 1854, p. 112 (describes *A. flavipes* and *A. lepidus* and *A. thoracicus*, now regarded as varieties of *A. scrophulariæ*); in Proc. Acad. Nat. Sci. Phil., 1876, p. 195 (occurrence at Albany); in Bull. G.-G. Surv. Terr., ii, 1879, p. 503 (Rocky Mts. at 6,000 ft. altitude).
- LINTNER: in The Argus [Albany, N. Y.], Oct. 21, 1876; in Schenectady Union, Oct. 21, 1876; in Trans. N. Y. St. Agr. Soc., xxxii, for 1872-1876, p. 236; in Count. Gent., May 31 and June 7, 1877, xlii, pp. 347, 363; in *id.*, Aug. 2, 1877, p. 491, c. 2-4 (stages, history, remedies, attraction to flowers, etc.); Entomolog. Contrib., iv, June, 1878, pp. 15-23, figs. a-d; in Amer. Nat., xii, Aug., 1878, pp. 536-544, figs. 1a, b, c, d; in Count. Gent., Sept. 12, 1878, xliii, p. 583, c. 2, 3; in Proc. Albany Institute, ii, 1878, pp. 310-313; in Count. Gent., Aug. 7, 1879, p. 503, c. 4; in Thirtieth Rept. N. Y. St. Mus. Nat. Hist., 1879, pp. 127-135 (general account); in Johnson's Nat. Hist., ii, 1880, p. 651, figs. a-d (brief notice of stages, etc.); First Rept. Ins. N. Y., 1880, pp. 9, 10, fig. 5 (brief notice); in Count. Gent., Aug. 23, 1883, xlvi, p. 681, c. 2 (its food and remedies); in Amsterdam Daily Democrat, July 21, 1884, p. 3, c. 3, 4 (habits, remedies, etc.); in Count. Gent., Aug. 14, 1884, xlix, pp. 676, 677, c. 4, 1 (history, habits, transformations, remedies, and preventives); in American Cyclopaedia, iv, 1883, p. 797; Second Rept. Ins. N. Y., 1885, p. 46 (mention); Fifth Rept. Ins. N. Y., 1889, pp. 267, 268, fig. 38 (habits and as a museum pest); Sixth Rept. Ins. N. Y., 1890, p. 118, fig. 11 (*Adalia* mistaken for it); in Count. Gent., Aug. 21, 1890, lv, p. 662, c. 3 (remedies); Seventh Rept. Ins. N. Y., 1891, p. 335 (introduction).

- SAUNDERS: in Rept. Ent. Soc. Ont. for 1878, pp. 33-35, fig. 14 (from Lintner in Amer. Nat.).
- HAGEN: in Proc. Bost. Soc. Nat. H., xx, 1878, p. 57 (noticed as a museum pest); in Canad. Entomol., x, 1878, p. 161 the same with figures, in Rept. Ent. Soc. Ont. for 1879, pp. 30, 31, fig. 1; in Boston Journal for July 15, 1879.
- RILEY: in N. Y. Tribune, Dec. 1, 1878 (ravages and remedies, figs.) *id.*, for Dec. 4, 1878 (food-habits, and spread); in Amer. Entomol., iii, 1880, pp. 53-55, fig. 15 (trapping the beetle); in Insect Life, ii, 1889, pp. 127-130, fig. 19 (general account).
- JAYNE: in Proc. Amer. Phil. Soc., xx, 1882, p. 369, figs. 66, 69 (descriptions).
- APGAR: in Science, for Nov. 21, 1884, iv, p. v (unaffected by Naphthaline).
- WEED: in Prairie Farmer, Sept. 10, 1887, p. 582, c. 2 (ravages in Michigan).
- HAMILTON: in Trans. Amer. Ent. Soc., xvi, 1889, p. 129 (its varieties).
- FERNALD: Bull. No. 5, Hatch Exp. St. Mass., July, 1889, pp. 3-6, fig. 1.
- BEUTENMÜLLER: in Journal N. Y. Microscop. Soc., vii, 1891, p. 14 (bibliography of early stages).
- Dermestes piceus* OLIVIER: Entomol., ii, 1790, p. 10, pl. 1, fig. 4 *a, b*; Encyc. Method. Hist. Nat. Ins., vi, 1790, p. 267.
- Dermestes megatoma* FABRICIUS: Ent. Syst. Supp., 1798, p. 71. 1; Syst. Eleuth., i, 1801, p. 313. 5.
- Attagenus spureus* LÉCONTE: in Proc. Acad. Nat. Sci. Phil., vii, 1854, p. 109.
- Attagenus dichrous* LÉCONTE: in Proc. Acad. N. S. Ph., viii, 1854, p. 110.
- Attagenus rufipennis* LÉCONTE: in Proc. Acad. Nat. Sci. Phil., 1859, p. 71.
- Attagenus* sp.? WALSH: in Pract. Entomol., i, 1866, p. 34 (in feathers).
- Attagenus megatoma*. PROVANCHER: Pet. Faun. Ent. Can.,—Coleop., 1877, p. 305.
- Attagenus megatoma*. HAGEN: in Proc. Bost. Soc. N. H., xx, 1878, pp. 56, 61 (as a museum pest).
- Attagenus megatoma*. LINTNER: in Count. Gent., xlv, 1879, p. 503 (feeds on carpets; *id.*, xlvii, 1882, p. 567, c. 2 (description); Ent. Contrib., iii, 1882, p. 64 (remedy); Second Rept. Ins. N. Y., 1885, pp. 46-48 (general notice of habits, etc.).
- Attagenus megatoma*. RILEY: in Amer. Nat., xvi, 1882, p. 1019 (causes felting); in Rural New Yorker, Oct. 14, 1882, xli, pp. 699, 700 (felting); in Amer. Nat., xvii, 1883, p. 790.
- Attagenus piceus* JAYNE: in Proc. Amer. Philos. Soc., xx, 1882, p. 355 (description), p. 374, pl. 1, figs. 22, 23 (antennæ).
- Attagenus megatoma*. DIMMOCK: in Cassino's Stand. Nat. Hist., ii, 1884, p. 378 (feather felting).
- Attagenus piceus*. HENSHAW: List. Coleop. N. A., 1885, p. 54, No. 3434.
- Attagenus piceus*. FERNALD: in Bull. 5. Hatch Agr. Exp. St., July, 1889, p. 6.
- Attagenus piceus*. HAMILTON: in Trans. Amer. Ent. Soc., xvi, 1889, p. 129 (distribution).
- Attagenus megatoma*. RILEY-HOWARD: in Insect Life, ii, 1890, pp. 317-318 (feather felting); in *id.*, iii, p. 170 (in houses).

*Attagenus piceus*. RILEY-HOWARD: in *Insect Life*, iii, 1890, p. 34 (incr. and inj. in Washington); pp. 65, 66 (injuring carpets); *id.*, iv, 1892, p. 345 (abundance and injury in Illinois), p. 404 (feather felting).

*Attagenus piceus*. BEUTENMULLER: in *Journ. N. Y. Microscop. Soc.*, vii, 1891, p. 14 (bibliography of larval descriptions).

Both of the above-named insects have been briefly noticed in former reports, but so frequent are the inquiries received in relation to them, and so serious the injuries that they inflict, that some additional notes on them may be acceptable and prove of service.

The publication of a Bulletin, to contain all that seemed desirable for practical purposes and of interest to know, which could serve as a convenient reply to the many inquiries made, has been in contemplation for some time, but it still awaits the leisure for its preparation. In the meanwhile the bibliography herewith presented should be of service to those desiring to learn more of its history and habits.

Some Features of *Anthrenus scrophulariæ*

In the accompanying diagrammatic drawings (after Jayne) representing the markings of the beetle as seen from above, *a* is that of the typical

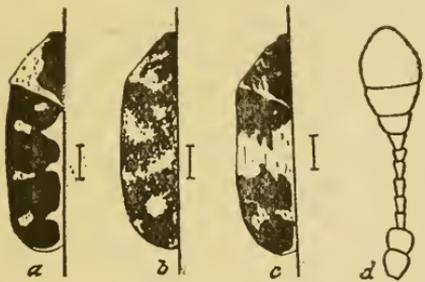


FIG. 1.—ANTHRENUS SCROPHULARIÆ: *a*, the typical form; *b*, var. FLAVIPES; *c*, var. THORACICUS; *d*, the 11-jointed antenna.

*scrophulariæ*. In comparison with Figure 2, reproduced from former reports, it more faithfully represents the hundreds of examples that have come under my observation, in the extended white marginal bordering of the thorax; while the white spots near the outer border of the wing-cover are too sharply defined and fail to connect with the red projections

from the sutural line so as to form the irregular transverse bands. It should be remembered that the line (sutural) along the joining of the wing-covers and its three inward projections are orange-red, and a striking characteristic of the species. There are, however, marked differences in ornamentation, which are to some extent local: two varieties bear the name of var. *flavipes* LeConte, (shown at *b* in Figure 1), and var. *thoracica* Mels., at *c*. At *d*, the 11-jointed clubbed antenna is represented, by means of which it may be separated from the other species of the genus.



FIG. 2.—ANTHRENUS SCROPHULARIÆ. (From Riley.)

### Ignorance Respecting the Carpet Beetles.

Almost every newspaper published in the United States has contained some account of the dreadful "carpet beetle" or "buffalo bug," giving its habits, describing its appearance, often accompanied by figures representing its different stages; still, there are many who are not able to distinguish it from a harmless lady-bug when they find the two in intimate association in rooms where carpets and clothing are evidently suffering from "carpet bug" attack.

The following letter, from Poughkeepsie, N. Y., in which this ignorance is displayed, is one of many of a similar tenor:

I herewith send you a small vial containing what is believed to be the carpet-bug in two, perhaps three, forms of its existence. The creature is giving us much trouble and injuring valuable property. If you can aid in identifying the animal, and in stopping its ravages, you will confer a great favor on many sufferers.

The little lady-bug has been found in great numbers about our dwellings, and in such relation to injured carpets, etc., as to create the belief that it is the veritable carpet-bug; but if I am right in supposing that the insect I send you is the "real, Simon-pure" little pest, then the pet lady-bug has been more "sinned against than sinning." E. L. B.

### Larval features of the two Insects.

The vial contained a specimen of the veritable carpet bug, which has become such a formidable household pest, but in its larval stage only — not in subsequent forms of its existence. In company with it was another larva and two perfect beetles. The larva of the obnoxious *Anthrenus scrophularia* was the one of an oval form, and clothed with stiff bristles standing out from it. It has received (perhaps in California, where it first became known in this country,) the name of the "buffalo-bug," from a fancied resemblance in its large and hairy front, to that animal.

The other larval form — of a reddish-brown color, with appressed hairs — long, slender, tapering to its tail, and ending in a pencil of hairs, — is also a carpet-bug, and the earlier stage of the two black beetles which were sent with it. It was for a long time known to science as *Attagenus megatoma* (Fabr.), but a few years since was found to have been earlier described by Olivier under the specific name of *piceus*.

### *Attagenus piceus* detected as a Carpet pest.

At the time of my detection of the *Anthrenus* carpet bug at Schenectady, the larva of *A. piceus* was associated with it. It was at first supposed that it was drawn to the borders of carpets to feed upon the dead bodies of flies and other insects that collected there, in accord-

ance with the general habits of the *Dermestidae*. Subsequently I have reared it upon pieces of carpets, and complaints have been received from Boston and elsewhere of its carpet-eating propensities. It may possibly prove to be almost as destructive to carpets as the *A. scrophularie*, for there can not be much doubt that its food is the same, and that it multiplies with equal rapidity.

#### Its Abundance.

Already in some houses it has become the more numerous. In my own residence the beetle has fallen under my observation, on window panes, thrice as often as its prettily ornamented rival. As it will assuredly ere long win a notoriety for itself, a common name will have to be selected for it, now that we have two "carpet-bugs", comparatively "new," both being beetles in their perfect form. Until a better name shall be found, this may be known as "the black carpet-beetle."

#### Description of the Beetle.

A brief description may be of value for its identification. It measures 0.15 to 0.18 inch in length. In outline it is elongate-oval, twice as long as it is wide, and rather flattened. Its head is small and so bent downward as hardly to be seen from above in cabinet specimens, but extended, and with its antennæ conspicuous, when walking; both it and the prothorax are black. The wing-covers are more or less reddish, finely punctured, with a short gray pubescence in fresh examples under a magnifier. The legs and the antennæ are reddish; the latter terminating, in a large ovate club, the last joint of which is grayish. Abdomen beneath, brown with short ochreous-yellow hairs. Legs brown. Outlines of the beetle and of its antennæ are given in Figure 3.

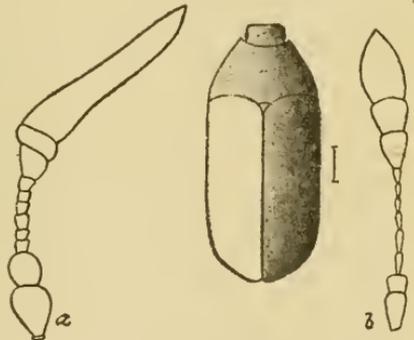


FIG. 3.—ATTAGENUS PICEUS; a, antenna of male; b, antenna of female. (After Jayne.)

#### Food of the Larva of *Attagenus Piceus*.

This insect by no means confines itself in feeding to woolens, but like others of the *Dermestidae*, its larva feeds largely upon dried animal matter. In the notice of "*Attagenus megatoma*," in the *Second Report on the Insects of New York*, 1885, pp. 46-48, its occurrence in hair-cloth furniture is mentioned, and the suspicion is

expressed that it eats lace curtains and other cottons, and that its range of food may embrace "hair, furs, cotton, linen, and wool." Even *Anthrenus scrophulariæ*, which in this country is hardly known except as a woolen pest, is developing a fondness for insects in collections, while in Europe it is recorded as eating furs, hides, leather, dried plants, animal collections, "all kinds of collections of natural objects, and victuals."\*

Dr. Hagen in his interesting paper on "Museum Pests, observed in the Entomological Collection at Cambridge," mentions the species as "exceedingly dangerous" to the collection.\*\*

#### Feather-felting by *Attagenus piceus*.

Professor Riley has recorded an instance of a remarkable felting of the inside of a pillow case with the soft parts of the chicken feathers with which it had been filled, through the feeding operations of this insect. The short, downy particles which had been stripped off were found inserted by their basal ends, the barbs of which would be caught by the repeated shakings and firmly anchored. "The felting was remarkably dense, evenly coating the whole surface of the ticking, and greatly resembling in softness, smoothness, and color the fur of a mole."† Another similar occurrence was related by Dr. Horn, and a specimen "resembling fine plush" exhibited to the American Entomological Society.‡

#### Remedies for the Carpet Beetles.

The best remedies for the two carpet beetles are, frequent searches for their larvæ in their haunts and crushing them, and the application of kerosene or benzine to the places where the eggs and young larvæ occur. The favorite locality for the *A. scrophulariæ*, as is probably known to most housekeepers by this time, is beneath the borders of carpets, and in the floor joinings underneath. These crevices should first be thoroughly treated with kerosene, and then closed with putty, or a packing saturated with kerosene. The crevices beneath the base boards should also be closed; by these means the retreat and escape of the larvæ will be almost entirely prevented, when the borders of the carpet are lifted for a thorough search for the larvæ, as should by all means be done, from time to time, in an infested house. The examina-

\* Hagen: in *Canadian Entomologist*, x, 1878, pp. 161, 162.

\*\**Proceedings of the Boston Society of Natural History*, xx, 1878, p. 61.

† *American Naturalist*, xvi, 1882, p. 1018.

‡ *Transactions of the American Entomological Society*, x, 1883, p. xvii.

tion will be more convenient and productive of better results if the carpet is left unnailed.

#### Possibility of Freeing Infested Houses from the Insect.

That freeing a house from the presence of this exceedingly annoying and destructive pest, is not a hopeless task, will appear from the account given by a correspondent of her successful campaign against it. The prefatory reference to her first acquaintance with the insect is of sufficient interest to quote, particularly as it gives an earlier time by several years for its observation in this country than had been previously recorded.\*

#### How a House was Freed from *A. scrophulariæ*.

In November, 1883, Mary E. Clark, of New York city, wrote to me as follows:

It may not be uninteresting to you if I add my mite to the information already gained in regard to these insects. I first heard of them about twenty years ago at which time they were quite domesticated in parts of Montgomery county, Penn. The people called them "woolly-heads," and one who lived there described them to me as looking like a little piece of black wool. A few years later—I think about 1868—when visiting a friend on Long Island, I saw quite a number of them: they had made their appearance only a short time previously, and before their presence was known had made great havoc with the carpets.

My own experience with them began last year. We moved to our present abode in April, and it was not until every carpet had been put down and the house settled that I was aware that we had such unwelcome guests. I was not long in observing their habit of running into any crack or crevice that presented itself, and also running along the joints of the floors, and our warfare against them was directed toward these joints. In the closets we stopped up every nook on the walls; every crevice under the base boards, and filled up the joints of the floor; then we laid down oil-cloth, and kept a plentiful supply of camphor in the closets. I am happy to say that we have had no trouble with them since so doing.

Fortunately, we had put paper under all the carpets, so we felt that they were in a measure, at least, protected, but I found them continually, just under the edges of the carpet. As far as possible, we filled up the crevices under the baseboards and I used benzine very plentifully all the summer, saturating the borders of the carpets every two weeks

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\* Examples of it, labeled *Anthrenus lepidus*, in the cabinet of Dr. LeConte had been received from Oregon "in 1871 or 1872." Dr. Hagen had heard of its operations in Buffalo, N. Y., in 1872. The first notice of its injuries was seen by me in 1874, and in 1876, examples were taken in my house at Schenectady, N. Y., and the new household pest brought to public notice. Its earlier observation in Pennsylvania accords with the statement made to me some time ago by a gentleman living in that State (the time and place have escaped my memory), that he had reason to believe that he was chargeable with its introduction into this country in a trunk which was found to contain them on his return from Europe.

and killing all I saw in the meantime. Last spring we varnished the cracks of the floors, and in some cases, where they were very open, covered them with strips of thin muslin stuck down with the varnish; we again put paper under the carpets, as we had found it such protection the previous year. I have found the various insect powders of no use whatever when the insect is in the larval state: whether or not it has any effect on the beetle I can not say; but this I can state,—that our unceasing warfare has not been in vain, for I have, during the past summer, seen only single ones where last year I found scores.

**The Two-spotted Lady-bug, mistaken for the Anthrenus Beetle.**

“The little lady-bug” mentioned in the inquiry from Poughkeepsie as occurring in great numbers in association with the carpet beetles, is the



FIG. 4.—The two-spotted lady-bug *Adalia bipunctata* (after Emmons).

two-spotted lady-bug, *Adalia bipunctata* (Linn.). It has frequently been mistaken for the carpet-beetle, and has come to an untimely end in consequence—in some instances having been collected on dust-pans and burned. It is unfortunate that such mistakes should occur, since it is to this insect more than to any other that we are often indebted for deliverance from a plant-louse infestation of fruit-trees, shrubs, and flowers. It has no resemblance whatever to the carpet-beetle, than which it is many times larger (see figures of the two in my 6th Report); the only reason for confusing it with the carpet pest is that it enters dwelling-houses in the autumn for passing the winter (the only one of the lady-bugs having this habit), and is frequently to be met with collected in corners underneath the carpets, or creeping or flying about when fires have been made in rooms ordinarily cold. It seems strange that, in this enlightened age, any household could be found in which none of its members could recognize so typical a lady-bird as the *Adalia* and know of its entire harmlessness. The lady-birds are quite common insects: they are attractive in their bright shining colors and conspicuous maculation; their form is peculiar—“gotten up,” as a reportorial wit has recently expressed it, “on the architectural lines of a split pea;” for centuries they have been cherished objects of admiration in the countries of the Old World, where peculiar associations or superstitions have been connected with them. From some one of these has doubtless been borrowed the motherly couplet that all of us have heard in our childhood and have ourselves uttered when some one of these pretty creatures had run up to finger-tip, and was about to unfold its wings for flight:

Lady-bird, lady-bird, fly away home,  
Your house is on fire, your children will burn.

**Tenebrio obscurus** Fabr.*The American Meal-worm.*

(Ord. COLEOPTERA: Fam. TENEBRIONIDÆ.)

FABRICIUS: Ent. Syst., i, pars i, 1792, p. 111. 5.

WESTWOOD: Classif. Insects, i, 1839, p. 318 (larva and habits).

CURTIS: Farm Insects, 1860, p. 334.

WALSH: in Pract. Entomol., ii, 1866, p. 34 (brief notice).

PROVANCHER: Pet. Faun Ent. Canada—Coleop., 1877, p. 448 (description).

LE BARON: 4th Rept. Ins. Ill., 1874, p. 123, f. 57 (figure only).

GISSLER: in Bull. Brook. Ent. Soc., i, 1878, p. 87 (of the larva).

RILEY: in Amer. Naturalist, xvii, 1883, p. 547 (number of molts).

LINTNER: in Count. Gent., lvii, 1892, p. 501 (habits, remedies, etc.).

BEUTENMÜLLER: in Journ. Microscop. Soc., vii, 1891, p. 41 (bibliography of early stages).

Although rather a common insect, very little seems to have been written of it by our economic entomologists, as appears from the quite limited bibliography presented above.

Examples of it were recently received from Buckland, Virginia, asking for information of their habits, as they had appeared in large numbers in a granary where wheat was stored.

**The Larva and the Beetle.**

It is greatly to be regretted that so few of our Coleoptera have been described, and of those few, many have been done in so general terms and so indifferently that they do not serve the purpose of identification. I am not aware of any description of *T. obscurus*. It may be said of it, as aid to its recognition when met with in the localities where it is apt to occur, that it is about an inch long, cylindrical, smooth, of an ochreous or pale-brown color, and with three pairs of legs on its front or thoracic segments, and that it has much the appearance of the common wire-worm. But this would apply equally well to several other species of the family of *Tenebrionidæ*.\* The larva is shown at *a* in Figure 5.

Perhaps the best specific characters in the larval *Tenebrio* are to be found in their pygidium—the designation of the upper part of the last abdominal segment. Mr. C. F. Gissler, *loc. cit.*, has given some study to the larvæ of the *Tenebrionidæ*, indicating pygidial differences between them. Of *T. obscurus* he finds: "Pygidium comparatively

\* See the excellent and greatly needed remarks made by one of our able Coleopterists, Mr. E. A. Schwarz, on many of the published "descriptions" of Coleopterous larvæ which are wholly wanting in either popular or scientific value," in the *Canadian Entomologist*, xxiv, 1892, page 223.

small, cordiform, with two minute articulated spines on each side, a little behind the middle, a median longitudinal groove, one lateral punctured notch, and two terminal small, suddenly turned-up hooks." A figure is also given of the "pygidium of *Tenebrio*," presumably of *T. obscurus*, which would seem to imperfectly illustrate the text, unless for "punctured notch" we read "punctured spot." The two terminal hooks, according to Westwood, distinguish the larva of this species from that of *T. molitor* (see Westwood, *loc. cit.*).

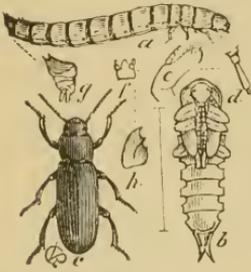


FIG. 5.—The meal worm. *TENEBRIO OBSCURUS*: a, larva; b, pupa; c, imago; d, antenna of larva; e, maxilla; f, labrum; g, terminal segment. (From Riley.)

The beetle, described in general terms, which should suffice for its recognition when taken in connection with its figure herewith given, is over a half inch in length, narrow, of a dull, opaque, black color above, with the underside, the feet and antennae chestnut-brown. The thorax is subquadrate. The elytra, or wing-covers, are closely punctured with sixteen depressed longitudinal lines, the intervals of which are angulated. The legs are stout; the hinder feet are four-jointed—the others are five-jointed.

#### Its Habits.

The name of the "American meal-worm" has been given to this insect to distinguish it from a closely resembling species, *Tenebrio molitor*, which has been introduced from Europe and has become much more common with us than the native one. It is the more injurious of the two, as it prefers for its food dry and sound flour, while *T. molitor* is more frequently found in that which has become damp or otherwise damaged. *T. obscurus* is said to feed sometimes on animal matter. Both of the species infest granaries, mills, and farm houses, and are justly regarded as very troublesome pests when they have gained a lodgment, it being a difficult task to exterminate them.

#### Remedy.

The best remedy for this, as for most of the other stored grain insects, as *Silvanus Surinamensis* (Linn.), *S. cassiæ* Reiche, *S. advena* (Waltb.), *Calandra granaria* (Linn.), *C. oryze* (Linn.), *C. remotopuncta* Gyll., *Tribolium ferrugineum* (Fabr.), *Sitotroga cerealella* (Oliv.), and others, is found in the use of bisulphide of carbon. The infested grain should be inclosed in a tight bin, and for each one hundred pounds, one ounce of the bisulphide of carbon may be placed in any convenient open vessel on top of the grain. It need not be inserted therein, as

has been directed by some writers, for the heavy vapor (about two and one-half times heavier than common air) will descend and permeate the mass and destroy the insect life—the beetle, the larvæ, or the eggs deposited on the grain. After a day or two the bin may be opened for the offensive odor to escape, and no injury will have been done to the grain, either for flouring, for feeding, or for seed.

It would be well in all cases where badly infested grain has been treated in the above manner, especially when it is to be converted into flour, to remove the dead insects by sifting or otherwise, as it is believed that bad results have followed the use of flour into which the elytra and dead bodies of the infesting insects had been ground up.

In consideration of the explosive nature of bisulphide of carbon, it is proper always to accompany the recommendation of its use with the caution that a light or fire should never be brought near it.

### *Pollenia rudis* (Fabr.).

#### *The Cluster Fly.*

(Ord. DIPTERA: Fam. MUSCIDÆ.)

FABRICIUS: Ent. Syst., iv, 1794, p. 314. 9 (as *Musca rudis*).

MACQUART: Hist. Nat. Ins.—Diptères, ii, 1835, p. 269 (as *Pollenia*).

ROB. DESVOIDY: Hist. Dipt. Env. Paris, ii, 1863, p. 600.

LOEW: in Amer. Journ. Sci.—Arts, 2d ser., 1864, xxxvii, pp. 318, 321 (introduced from Europe).

HARRIS: Entomolog. Corr., 1869, p. 336 (as *Musca familiaris*).

OSTEN-SACKEN: Cat. Dipt. N. Amer., 1878, p. 160.

MANN: in Psyche, iii, 1882, p. 378 (habits).

DALL: in Proc. U. S. Nat. Mus., v, 1884, p. 635 (habits).

RILEY: in Amer. Naturalist, xvii, 1883, pp. 82, 83; in Proc. U. S. Nat. Mus., v, 1884, pp. 637, 638 (habits, synonymy, etc.).

MARLATT: in Insect Life, iv, 1891, p. 153 (killed by fungus).

LINTNER: in Count. Gent., lvii, 1892, p. 358 (general notice).

RILEY-HOWARD: in Insect Life, v, 1893, p. 263 (in Illinois, habits, remedy, etc.).

*Pollenia rudis* (the *Musca rudis* of Fabricius) was known and name given to it in Europe a century ago. When it was introduced into this country is not known, but commercial intercourse may have brought it at any time either in its larval or perfect stages. Dr. Loew, in an article in Silliman's Journal of Science, in 1864, mentions it in a list of species of flies known to be common to Europe and America. Of these, a number are believed to have first made their appearance on the Pacific coast and gradually to have worked their way to the Atlantic States. Presuming the *P. rudis* to

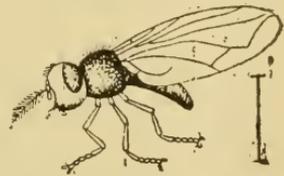


FIG. 6.—The cluster fly, POLLENIA RUDIS. (After Macquart.)

have been one of these, it would account for the absence of any early notice of its peculiar habits in hibernation that would naturally have attracted observation to it.

#### What the Fly Is.

The fly has been sent to me on several occasions during late years, with inquiry if it was the common house-fly, and telling of its abundance or strange conduct that drew attention to it.

While belonging to the same family with *Musca domestica*, viz., the *Muscidae*, and to the ordinary observer bearing a general resemblance to it in size and appearance, a comparison of the two would show marked differences between them. *P. rudis* may be recognized by its sluggish movements when on or about the windows, as if partially stupefied; a somewhat larger size than *M. domestica*; its

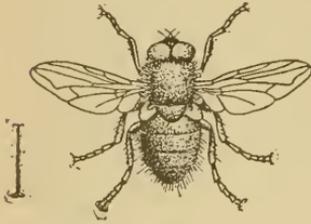


FIG. 7.—The cluster fly, *POLLENIA RUDIS*. (Original)

black thorax (in fresh examples) covered with rather closely appressed tawny-colored hairs, sometimes inclining to a green shade; its grayish abdomen marked above with two black quadrate spots on each segment, and a black edging to the segment; and its black legs. See fig. 7.

So little was known of the insects of our country fifty years ago that it is not surprising that among the manuscript material left by Dr. Harris, there should be found descriptions of the two above-named species, under the names of *Musca hurpyia* and *Musca familiaris*,—the former since recognized as the common house-fly, and the latter the cluster fly.

When with progress in entomology it was found necessary to subdivide the old genera of Linnaeus, Fabricius, etc., the genus of *Pollenia* (suggested by the pollen of flowers) was founded by R. Desvoidy in 1830 for those *Muscids* having, among other features, the thorax covered with a down-like clothing, classing them as "*Muscidae tomentosæ*." *P. rudis* was named as the type of the genus, which included about twenty European species. Of North American species, Osten Sacken (1878) has named but one other *Pollenia*, *P. vespillo*, occurring in Nova Scotia.

#### Its Common Name.

The popular name of the "cluster fly" has been given to this insect in consideration of its habit of leaving the flowers, fruits, branches or trees, walls, etc., upon which it is often to be seen during the summer months, and entering dwelling-houses in the autumn, for hibernation, where it gathers at times in large clusters on the walls and ceilings, and especially in the corners that they form.

**What Has Been Written of Its Habits.**

Not having at hand the writings of Desvoidy, Meigen, and other European entomologists who have written of this insect, I am not able to state what has been narrated by them of its habits. Our own literature relating to it is quite limited.

A note of two pages on "Cluster Flies" is contained in the *Proceedings of the U. S. National Museum* for 1883, vol. v, by W. H. Dall, based on specimens of the insect received from the vicinity of Geneva, N. Y., where it was reported as a great nuisance in the country houses. They were said to have first appeared in that locality about thirty years before. In the meantime they had increased until they had become a serious annoyance to housekeepers, as they intruded into places where flies do not ordinarily take up their abode, as "in beds, in pillow-slips, under table covers, behind pictures, in wardrobes, nestled in bonnets and hats, under the edge of carpets," and in many other unusual and unexpected places. A window-casing removed, disclosed "a solid line of them from top to bottom." Their preference seemed to be for a clean, dark chamber seldom used, where they were wont to gather in large clusters about the ceilings. It is also stated of them that they sometimes suspend themselves from the cornice of a room in large clusters like swarming bees, which could be brushed bodily into a vessel of boiling water: this statement, however, we can not vouch for, and it needs verification.

To Professor Dall's notice, Professor Riley has contributed about all of the scientific knowledge we have of the fly, including the several names under which it has been known during the last hundred years, together with some additional notes of its habits. A note by Professor Riley on "The Cluster Fly," in the *American Naturalist*, *loc. cit.*, may also be consulted.

Mr. B. P. Mann has recorded in *Psyche*, for August, 1882, its occurrence in Maine, where the flies are reported as having the habit of burrowing into homespun yarn and the goods of loose texture made therefrom, to feed, as was supposed, on the greasy matter that remained in them. They were thought, also, to cut the threads.

Although the fly appears to have obtained a wide distribution in this country, the above are the only notices that I find of attention having been drawn to its habits of congregating in houses in large companies. I am able to add two other instances of the kind, with the probability of a third.

**The Fly Observed in St. Lawrence County, N. Y.**

In a visit made to Hammond, St. Lawrence Co., during the first week of October, 1883, for observations on a remarkable occurrence of

the chinch-bug, large clusters of the fly were seen in the corners of the walls and ceiling of a second floor bedroom of the farm house that I occupied. They were in irregular black masses, each consisting of several hundreds of individuals. A few were found to have hidden away within the bedding. The weather at the time was quite cold, and frosts prevailed during the nights.

#### A Pest in a House at Palenville, N. Y.

Last spring, about the middle of April, a lady brought to me examples of flies taken in her house at Palenville, Greene Co., N. Y., where they were abounding in most disagreeable numbers. They were found in every room, and all her efforts to destroy or eject them had been fruitless. They were recognized as the cluster fly, and pyrethrum powder was recommended for killing them. The powder was used after the manner directed, and proved entirely effective. Dustpanfuls, as I was afterwards informed, of their dead bodies were swept up and burned.

#### Another Spring Appearance of the Fly.

A number of years ago — somewhere about 1875 — when residing in Schenectady, N. Y., upon returning from church one morning, the windows of a ground-floor front room with a sunny exposure, were found to be so thickly dotted with flies as to arrest the attention of passers-by. They were ejected by brushing from the panes as speedily as possible, without examination; but recalling their features and movements, it is hardly possible that they could have been any other species than this *Pollenia*. At that time it was unknown to us by name.

#### Its Entrance in Dwellings and Departure.

It would appear, from this and the preceding account, to be the habit of the fly, to emerge in company from their winter retreat on some warm day in early spring, unlike their method of entering in the autumn, when they steal in singly, one by one, even with closed windows and doors, and during successive weeks or months.

Since first observing the fly, a few years ago, it has been a regular visitant to my office on the fourth floor of the Capitol. It does not collect in clusters, but each year in October and November, individuals to the number, perhaps, of from thirty to fifty may be seen resting on, or slowly walking over, the lower portion of the window frame or pane. Several specimens in the State Collection bear the late date of December 3d. Referring to my notes of the present year, I find: "September 29th, a number of *Pollenia rudis* on the window of my office." A few individuals had been seen some days earlier.

#### Other Species that Hibernate Within Doors.

There are a number of other Diptera that avail themselves of the shelter and comfort of our dwellings for their protection and repose during the months of autumn and winter. A German author, as quoted by Riley, records the swarming of two other species of *Pollenia*, viz., *P. atramentaria* and *P. vespillo*, in the same building for several successive years.

Mr. B. P. Mann (*loc. cit.*) has written: "I remember that during one or two years, at a certain season, which, as far as my recollection serves me, was in April, I noticed numerous specimens of *Microdon globosus*, a syrphid fly, issue from a nail-hole in a plastered wall of an apartment in a dwelling house, as though the flies had passed the winter within the walls of the house."

The many interesting features attending the in-door hibernation of one of the *Oscinida* — *Chlorops prolifica* of Osten Sacken, have been presented at considerable length in my Fourth and Seventh Reports. This species, however, has not yet become a common nuisance, disagreeable as it may be to the inmates of the house that it selects for its annual winter abode, as we know of its occurrence in only three localities in the United States.

Baron Osten Sacken has kindly contributed to the Fourth Report above referred to (page 72) several notices of assemblages of one or more species of *Chlorops* (they were not authoritatively determined) within occupied buildings in Europe, for hibernation: In one instance it was estimated that eighteen millions of one species had gathered, in September, on the ceiling of a botanical conservatory in Warsaw.

It is quite probable that numbers of the common house-fly (females) pass the winter within the houses that they have been previously occupying, hidden away within crevices about the windows, but it is not recorded that they ever assemble in companies at such times, either for warmth or from social instinct.

#### Early Stages of *Pollenia rudis*.

It is not known that the early stages of this insect have been observed in this country, or minutely anywhere. R. Desvoidy has given the general statement of the European *Pollenias*, that their eggs are laid in decomposing animal and vegetable matter. According to Macquart, their larvæ develop in the manure pile and cow droppings—"sans le ferrier et les bouzes."

#### Description of the Fly.

The description of this fly, left in MS. by Dr. Harris under the name of *Musca familiaris*, as previously referred to, is as follows:

Head somewhat prominent in front, of a dirty yellow or tawny color with a silky lustre, and distinct black bristles; eyes in the male conni-

vent above, in the female distant, with an interposed, oblong, black spot, furcate above and below, antennæ blackish, with the articulations piceous or ferruginous. Thorax black, covered with a close, dirty yellow or fulvous, coarse pubescence, with remote, curved, black bristles. Wings at the articulations and extreme base, ferruginous. Winglets and poisers white. Legs rusty black, with black hairs. Abdomen with distant, curved, black bristles, in both sexes cinereous, with a silky lustre, each segment with two quadrate black spots, and widely edged with black, varying in situation and degree, according to the incidence of the light.

This species, not uncommon in houses in summer, nearly disappears when the more abundant *M. harpyia* [*domestica*] appears.

#### Remedies.

Whenever this fly intrudes in such number as to render its destruction desirable, this can readily be accomplished by the use of pyrethrum. If they are gathered in clusters, the insecticide may be conveniently thrown upon them with a powder bellows. Should they be scattered throughout the room, the powder may be distributed through the atmosphere of the apartment, first closing the windows and doors, and driving up the flies that they may be brought more directly under its influence.

That the pyrethrum is effective against these flies, notwithstanding a statement that has been made to the contrary, is shown from the note received from my Palenville correspondent, to whom its use in her emergency had been recommended:

"I send my kindest thanks for the advice which has cleared my house of its army of flies. I used the pyrethrum with bellows, and send you a trophy of its success. We swept up dustpanfuls of them, and are now entirely free from their annoying presence."

#### Killed by a Fungus.

Mr. C. L. Marlatt, of the Entomological Division, U. S. Dept. Agriculture, at Washington, in recording, in *Insect Life* (*loc. cit.*) an extraordinary mortality among flies observed by him on the grounds of the Agricultural Department, in the autumn of 1891, states, that among the large number of dead flies that were thickly covering the underside of the leaves and were fastened by a fungus growth—often as many as eight or ten flies on a single leaf—most of them were *Polletia rudis*. The fungus was not, as was at first supposed, the common fungus of the house-fly, viz., *Empusa musca*, which is not uncommon in houses on windows, etc., during the late summer and early autumn, but was determined as a species recently described by Dr. R. Thaxter, as *Empusa Americana*, which, so far as known, occurs only out-doors, on vegetation, etc.

**Murgantia histrionica** (Hahn.).*The Harlequin Cabbage-bug.*

(Ord. HEMIPTERA: Subord. HETEROPTERA: Fam. PENTATOMIDÆ.)

A correspondent from New Jersey sends examples of insects which are for the first time injuring his cabbages that have been put out for seed (not noticed on others).

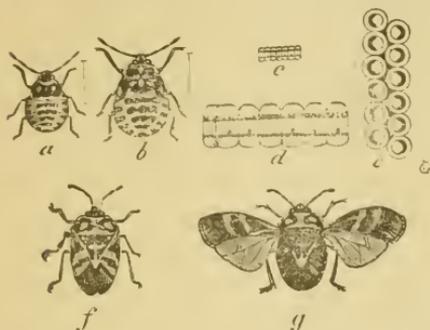


FIG. 8.—The Harlequin cabbage-bug, *MURGANTIA HISTRIONICA*: *a* and *b*, the larva and pupa, enlarged; *c*, the eggs, natural size; *d*, side view of the eggs showing the bands; *e*, end view of same, showing the lid for the escape of the larva; *f*, the adult insect; *g*, the same, with expanded wings. (From Riley.)

They were recognized as the insect above named, upon which an article giving description, life-history, habits, and other details relating to it, together with the accompanying illustration, is contained in my First Report.

The steady progress northward of this cabbage pest is of interest not only to entomologists, but particularly to cabbage growers in New York and elsewhere not far removed from the northern

boundary of its present operations.

From Texas, where it was first observed about twenty-five years ago as severely injuring the cabbage crop, it has been slowly and steadily extending eastward and northward, with an annual progression that within a few years will, in all probability, carry it into and over New York and the New England States, and other States lying in the same parallels of latitude. It was operating in Southern California several years ago. It had previously been reported from Delaware, in the latitude of the southern line of Pennsylvania, but this is the first instance, to my knowledge, of its recognition in New Jersey, and therefore worthy of special note.

As Professor Smith has not included the species in his recent "*Catalogue of the Insects of New Jersey*," published in 1890, it certainly has not as yet become common or notably injurious to cabbage culture in the State. Woodbury, whence the insects came, is in the southwestern portion of the State, a few miles south of Philadelphia.

The date at which they were received leaves in doubt whether they were hibernated individuals, or if they were matured forms of the first spring brood (other broods follow through the summer). In the warmer climate of Texas, eggs are deposited as early as the last of February. The development of the insect is remarkably rapid, for under favorable conditions the period from the deposit of the eggs to the appearance of the mature form may be less than three weeks.

*Remedies.*—So destructive to cabbage and so difficult to combat is this insect, that its advance northward into territory yet unoccupied by it should be resisted by every means that can be efficiently employed, and by hand-picking when every other remedy seems to fail. The arsenites are powerless against it, as it belongs to the suctional class which feed through a beak and not with biting jaws. Experiments that I have made with pyrethrum and hellebore have shown but transitory effects, and fail to kill. Kerosene emulsion would probably prove equally valueless. In my First Report, before cited, the following recommendations were made, as the best methods known for attacking it: 1. Sprinkling with hot water of as high a temperature as the plants will bear. 2. Trapping with leaves plucked from the plants and spread on the ground, beneath which the bugs will retire on cold nights, and where they may be found in the morning and killed. 3. Burning the waste leaves, stalks, and weeds in the autumn, in which many of the adult insects pass the winter. 4. Destroying the first brood in the early spring by crushing the eggs. These may easily be found on the leaves, as they are conspicuous from their beautiful ornamentation, being white, tinged with green apically, surrounded by two sharply defined black bands of which the upper one is the broader, and having the apex bordered upon its depressed lid with a black crescent. The eggs are placed on end on the leaves fastened to one another, and often arranged in two rows of six each. With this description of the eggs, they can be easily recognized, and not mistaken for any others. 5. The hibernating bugs, when first resorting to the plants for oviposition, should be picked off by hand, or if too abundant for this, which they seldom are at this time, as many that go into winter quarters fail to survive its rigors and the enemies to which they are exposed, they may be knocked off the plants with a stick into a pan of water and kerosene.—(*Country Gentleman* of June 9, 1892.)

*A new remedy.*—Mr. H. E. Weed, Entomologist of the Mississippi Agricultural Experiment Station, premising that “there is but one efficient remedy for this insect, which is to destroy the brood which lives over winter” before their oviposition, has proposed a method which he has found successful in controlling “by far the worst cabbage pest of the South.” It certainly gives promise of being the most simple and effective method yet discovered. Mr. Weed recommends that a row of mustard or radish plants be run on the sides or through the middle of the cabbage patch or field, and as the *Murgantia* will be drawn to these in preference to the cabbage,—when they have collected thereon, they may be killed by the application of kerosene. It does

not appear from Mr. Weed's report that the hibernating individuals were killed by this method. He states:

Our present crop of cabbage was put into the field early in March, and at the same time a row of radishes was planted through the middle of the patch. The radishes were well grown by the time the second brood of bugs [the first spring brood] had hatched, and nearly all the insects found their way to the radishes, where they were killed by spraying with kerosene. At this date, June 15, hardly a single bug is to be found in this patch, while cabbage planted in other parts of the grounds are badly infested. (*Bulletin No. 21 of the Mississippi Agricultural Experiment Station, June, 1892.*)

Unless there should be no survivors of the radish feeders which might transmit, through heredity, an especial fondness for that plant to their successors, it would seem to be desirable that only mustard, if equally attractive, should be used as a bait. We have no knowledge that *M. histrionica* has been reported as a radish pest, although long known to feed on it and on other Cruciferae, but another member of the genus, probably *M. munda* Stal, has recently appeared in that role, in California (*Insect Life*, iv, 1891, p. 83).

### *Psylla pyricola* (Foerster).

#### *The Pear-Tree Psylla.*

(Ord. HEMIPTERA : Subord. HOMOPTERA : Fam. PSYLLIDÆ.)

FOERSTER : in Verhandl. d. naturh. ver. d. preuss. Rheinlande. v. 1848, p. 77.

HARRIS : Treat. Ins. New Engl., 1852, pp. 201-204; Ins. Inj. Veg., 1862, pp. 231-234 (early observations, habits, description, etc.).

FITCH : in Trans. N. Y. St. Agricul. Soc., xvi, 1856, p. 353; 3d-5th Repts. Ins. N. Y., 1859, p. 35 (brief mention).

UHLER : in Rept. Commis. Patents for 1860. 1861, p. 314 (discovered in U. S.).

PACKARD : Guide Study Ins., 1869, p. 53 (mention) : Entomol. Begin., 1888, p. 82 (mention).

WALSH-RILEY : in Amer. Entomol., i, 1869, p. 225 (mention, in Eastern States).

LEBARON : 2d Rept. Ins. Ill., 1872, pp. 134-136, figures (injuries in Illinois).

GLOVER : in Rept. Commis. Agr. for 1876. 1877, pp. 33, 34, fig. 36 (description, localities, etc.).

THOMAS : in 7th Rept. Ins. Ill., 1878, p. 73, fig. 12 (mention); in 8th Rept. do., 1879, p. 13, fig. 2, pp. 16-17 (general account, remedies, etc.).

BARNARD : in Proc. Amer. Assoc. Adv. Sci., xxviii, 1880, pp. 478-486, plate (as *P. pyrisuga*).

ASHMEAD : in Canad. Entomol., xiii, 1881, p. 220 (questions Kollar's account of habits).

RILEY : in Proc. Amer. Assoc. Adv. Sci., xxxii, 1884, p. 319 (mention); in Proc. Biolog. Soc. Wash., 1884, p. 69 (referred to *pyricola* of Foerster); in *Insect Life*, v, 1892, p. 103 (synonym).

LOEW : in Neue Beiträge, zur Kenntniss der Psylliden-Verh. Wien Zool.-Bot., Gesell., xxxvi, 1886, p. 154.

COMSTOCK : Introduc. Entomol., 1888, p. 171 (brief reference).

SAUNDERS : Ins. Inj. Fruits, 1889, pp. 145, 146, figs. 151, 152.

LINTNER: in Count. Gent., lvi, 1891, pp. 317, 374, 637; in Canad. Entomol., xxiii, 1891, p. 230 (in Hudson river valley); in Science, xix, 1892, p. 343; 8th Rept. Ins. N. Y., 1893, p. 219.

RILEY-HOWARD: in Insect Life, iv, 1891, pp. 127-9 (description and habits from Loew), p. 225 (occurrence in New York); *id.*, v, 1893, p. 200 (is undoubtedly *P. pyricola* of Foerster), pp. 226-230 (observations of Mr. Slingerland, and dimorphism).

POWELL: in Orange County Farmer, May 21, 1891 (brief notice).

FISHER: in New Engl. Homestead, Dec. 5, 1891; in Bull. No. 17, Hatch Agr. Exp. St., 1892, p. 24 (habits and remedy).

LODEMAN: in Garden and Forest, v, 1892, p. 285 (brief notice of habits, etc.).

SLINGERLAND: in Count. Gent., lvii, 1892, p. 629; in Canad. Entomol., xxiv, 1892, p. 207 (injuries, broods, remedy); in Insect Life, v, 1892, pp. 100-103 (description, transformations, remedies, etc.); Bull. 14, Cornell Univ. Agr. Exp. St., Oct., 1892, pp. 159-186, 7 figs. (full account).

SMITH: in Canad. Entomol., xxiv, 1892, p. 207 (copper and London purple spraying for it); Insect Life, vi, 1893, p. 192 (injuries and spread in New Jersey).

Until within a few years the pear tree has been remarkably free from insect attack — the amount of injury from such source being probably less than five per cent of that to which the apple tree has been subjected. Recently two pests have forced themselves upon the notice of pear-growers, which have already inflicted serious losses, and threaten, unless arrested, greatly to interfere with the cultivation of this most excellent and prized fruit. Of these, the pear midge, *Diplosis pyrivora* (noticed in the preceding Report), which was introduced in this country about the year 1880, has not become broadly distributed, and has not occasioned much trouble except in western Connecticut and in portions of the Hudson river valley.

The pear-tree Psylla is also an introduced insect, which has been with us for a number of years — how long, is not known, but long enough to have carried it into some of our western States. It has, at times, multiplied exceedingly in particular localities and become very destructive, as notably in the summer of 1891, in the Hudson river valley, in association with the pear midge. Fortunately, however, after continuing its injuries for a few years, its excessive multiplication seems to



FIG. 9.—The pear-tree Psylla, *PSYLLA PYRICOLO*, male.

operate as a check to its further increase, and to consign it for another term of years to insignificance in numbers and comparative harmlessness.

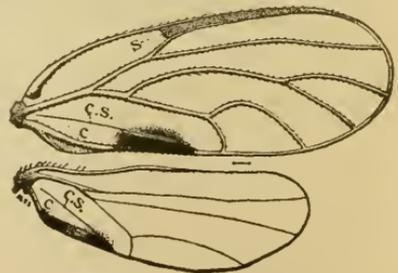


FIG. 10.—Wings of the pear tree Psylla; c, clavus; c. s., claval suture; s, stigma.

Through the kindness of Mr. M. V. Slingerland, of the Cornell

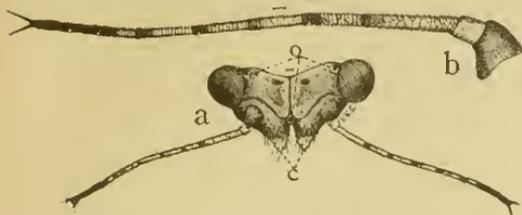


FIG. 11 — Head of the pear-tree Psylla: *a*, front view; *b*, antenna greatly enlarged; *c*, frontal cones; *o*, ocelli.

University, Ithaca, N. Y., we are enabled to present the excellent figures of the insect in its immature and perfect stages which illustrate this notice. Figure 9 represents the insect in its perfect winged stage; in Figure 10 the venation and markings of the wings are shown, greatly enlarged; Figure 11 gives enlargements of the head and antennæ, showing the two characteristic bristles at the tip of the antenna.

#### The Family Psyllidæ.

The family to which this species belongs is nearly related to the Aphides (*Aphidida*), or plant-lice, coming next to it among the Homoptera in classification, but are stouter forms and of firmer texture. In general appearance the winged insects look like miniature Cicadas. Their head is broad, short, generally triangular in front, where it is cleft or bilobed with the lobes projecting conically forward; the eyes are large and project from the sides, with three simple eyes or ocelli in a triangle on top of the head; the antennæ are rather long, slender, and thread-like, usually ten-jointed and terminate in two small bristles — a distinguishing characteristic of the family; the beak is short, three-jointed and arises from between the fore-legs, and is fitted with a groove for securing it. The wings are sub-leathery or transparent, large, the front pair with the midrib three-branched, and these again bifurcating (see Figure 10); in repose they are placed over the abdomen in a steep roof; the hind wings have a few longitudinal and delicate veins. The abdomen of the female ends in a short conical ovipositor. The legs are fitted for leaping, having the thighs (femora) thick and the hindmost shanks (tibiæ) armed with spines; the feet (tarsi) are two-jointed. In their ability to leap, as also in their feeding habits, they resemble the smaller leaf-hoppers of the grapevine and rose.

The larvæ have a broad head, flat body, rounded abdomen, with the antennæ at first one-jointed. Some species are covered with a cottony secretion, or they may be naked, or covered with a honey-dew as in the pear-tree Psylla. The pupæ are distinguishable by their stouter forms and the projecting wing-pads on their sides.

#### Earliest Notice of the Pear Psylla in the United States.

According to Dr. Harris, this insect was observed by Dr. Ovid Plumb, of Salisbury, Conn., "in the spring of 1833, on some imported pear

trees which had been set the year before: These trees, in the autumn after they were planted, wore an unhealthy aspect, and had patches of a blackish rust upon their branches. During the second summer, the trees died; and other trees on which this same rusty matter was found, proved to be infested with the same insects."

Whether the insect had appeared in the United States prior to this is not definitely known, yet there is reason to believe that it may have been operating in the State of New York as early as in 1824, if not in the preceding century.

In an article on "Pear-Tree Blight" by Dr. J. J. Thomas, in the *Cultivator* for June, 1850, vii, p. 204, it is stated that Mr. E. J. Genet had written expressing his belief that the disorder was caused by an insect observed by him, and operating in the following manner: At a little before midsummer, in the absence of dew for several nights, liquid drops could be seen falling from a pear tree, which was subsequently found to proceed from minute aphides thickly covering the shoots or branches, and which had at first escaped notice from the indentity of their color with that of the pear bark. They continued for about ten days, and then disappeared. The varnish which these insects exuded was regarded as poisonous to the tree.

Mr. Genet states that the same disorder had appeared on the banks of the Hudson in 1780-1793, and in 1802-1807. As these attacks may not have been seen by the writer, it is not improbable that they were the true "pear blight." "In 1824," Mr. Genet writes (probably from personal observation), "the same disorder prevailed, and lasted four years. In 1846 we were once more suffering from the same cause, and our pear trees are still prostrated by its fatal attacks. This disease has been called by some 'fire-blight.' One writer says it is produced by the *Aphis lanata*, a small insect covered by fine, white wool, but the insect which came under my observation is very different in every characteristic — so small as to escape observation in the first stage, and so similar to a fly at maturity as to mislead an inattentive observer."

As the insect, from characters given, could not have been the common and well-known apple-tree aphis, there can hardly be a doubt of its having been the pear-tree *Psylla*. Its introduction may easily have occurred as early as 1824, as pear-trees had been imported by nursery-men for thirty years prior to that date.\*

Dr. Harris' attention was first drawn to the *Psylla* in 1848 by Dr. Plumb, through a communication published in the *American Agricult-*

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\* See article on "Early Pear Importations" in the *Country Gentleman* for December 1, 1892 page 907, where importation of pear-trees as early as in 1794 is recorded, and of other fruit-trees in the first decade of the present century, which, doubtless, "would easily be the means of importing such noxious insects as infested them."

tourist for January, 1849, page 29. In this Dr. Plumb states that he had lost several hundred young pear-trees between the years 1834 and 1838. It was not from the pear blight, which first shows itself in the leaves. But in this attack the bark turns black, sometimes commencing in July, more often in August, and then again not until September. It had not troubled him since 1838 until the present (1848), when he believed that he had found the cause of the trouble in an insect which he observed on the affected trees in September, although they might have been there earlier. None were seen on the trees not affected. They looked to him like aphides, and jumped like fleas. Specimens were taken from his trees about the middle of November, and sent to Dr. Harris.

From Dr. Harris' reply, published with the above, we learn that the specimens received were in the winged state, both males and females. From their injured condition and changed colors in drying, he was unable to name the species, but thought it probable that they were the *Psylla pyri* of Europe. Their habits and transformation not unlikely would be found to be similar to those given by European writers; these are quoted by Dr. Harris, including the remedies recommended by Kollar, substantially as given in the "Insects of New England" and later editions of the same. The letter of reply concludes with the following description of the specimens received from Dr. Plumb:

Description by Dr. Harris of the *Psylla*.

The insects were of a brownish color, with transparent wings, marked by a few dark veins. Each measured one-tenth of an inch or rather more, from the forehead to the tips of the closed wings. The front of the head is notched in the middle. The eyes are large and prominent, and with the thorax resemble somewhat in form those of our common cicada. The antennæ are longer than the body, slender, or threadlike, and are tipped at the end with two little bristles. The body of the female is pointed at the end, and is more of a reddish hue than that of the male.

In 1857, Dr. Harris saw the living insects on the trees at Salisbury. Of these he has written: "On the 23d of July, I saw these insects on the trees, some already provided with wings, and others advancing toward maturity. The young ones [pupæ] were of a dull orange-yellow color. They were short, and were obtuse behind, and had little wing-scales on the sides of their bodies [omitting what is given above of the winged forms]; the head and thorax were brownish-orange, and the hind body greenish. Their four ample wings were \* \* \* \* colorless \* \* \* \* The European, *P. pyri*, is said to vary in

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\* *Insects of New England*, 1852, p. 203. *Insects Injurious to Vegetation*, 1862, p. 232.

color at different ages, and in different seasons of the year, being of a dull crimson color, shaded with black in the spring, when it comes forth to lay its eggs. Not having seen any of our pear-tree *Psyllæ* in their spring dress, I can not say whether they agree with those of Europe in being of the same crimson color at this season of the year."

#### The Psylla Referred to *P. pyricola*.

In the bibliography herewith given, all of our earlier writers have accepted it as probably identical with the *Psylla pyri* of Europe, with the sole exception of its description and illustration by Dr. Barnard under the name of *P. pyrisuga*. Dr. Riley, I believe, was the first to detect specific characters separating it from that species, and to refer it to *P. pyricola* — one of the three closely allied species which attack and injure the pear tree in Europe, of which, according to Dr. Loew, "*P. pyrisuga* Foerster is found throughout Central Europe in large numbers annually, and is a great pest; *P. pyri* Linn. is comparatively rare, appearing in small colonies, but is widely distributed; *P. pyricola* Foerster occurs in some localities in large numbers, particularly infesting dwarf pears, and on many occasions considerable damage."\*

In his reference to *P. pyricola* Dr. Riley states: "This is the Pear-tree Psylla of our Northern and Western States, and its reference to Foerster's species is made after comparisons with European specimens received from Meyer-Dür and Lichtenstein."†

The identity of our species with any of the European has been questioned by some of our writers, but for the present, at least, we must accept Dr. Riley as authority, he having recently, in reply to inquiry made, written me even more explicitly than quoted above: "The common pear-tree Psylla of New York and Massachusetts is unquestionably *P. pyricola* Foerst., and agrees perfectly with European specimens sent me by Dr. Loew."

#### Its Recent Multiplication in the Hudson River Valley.

Like many other of our insect pests, the Pear-tree Psylla, from time to time, and for a longer or shorter term of years, is favored with conditions peculiarly fitted to its increase, which are again followed by corresponding periods of almost entire exemption from its presence. Thus, according to Dr. Plumb, it was not noticeably present in his orchards for the ten years following the year 1838, previous to which it had annually been very destructive.

\* From an abstract by Riley-Howard in *Insect Life*, iv, 1891, p. 127, from Dr. Loew, *loc. cit.*

† *Proceedings of the Biological Society of Washington*, ii, 1884, p. 69.

Up to the year 1891, the insect was known to me only by name. In the spring of that year I first made its acquaintance, after the manner related below in the *Country Gentleman*, of April 16th.

EDS. COUNTRY GENTLEMAN.—A gentleman has sent to me from Athens, N. Y., a package of pear twigs taken from his orchard, which are quite blackened with what he calls "honey-dew." Many other orchards in Greene county are affected in the same manner. Mention was made of this peculiar appearance at the Farmers' Institute recently held at Coxsackie [March 20th]. As it was thought that it might possibly have some connection with the fungus disease known as "apple-scab," which occurs upon the fruit and leaves and also on the twigs of the apple and the pear, infested twigs have been, by request, sent to Albany for examination.

The blackening is apparently of the same kind as that which we find upon hop leaves, elm leaves and other foliage which have been infested with plant-lice, the excretion from which, known as "honey-dew," has collected upon the upper surface of the leaves—at first of a limpid appearance, but in drying and with age becoming blackened. Subsequently a fungus growth usually occurs on the surface of the honey-dew and increases the blackness. The fungus is present in the examples received, as detected by State Botanist Peck, but as it is of a harmless kind, being superficial only and not penetrating the bark, neither it nor the dried honey-dew on which it rests can be of any particular injury to the trees.

It is desirable, however, that the cause of the honey-dew should be removed. The insect that excretes so large a quantity can not be otherwise than injurious. I know of no aphid (plant-louse) that infests the pear in sufficient numbers to produce such a deposit. It is probable that examination during the month of May will show the presence, in association with fresh honey-dew of an allied insect, known as the pear-tree *Psylla* (*Psylla pyri*), which is known in some localities to infest the twigs of the pear in large numbers, and, by sucking the sap, to occasion a large flow of the honey-dew. It has not been observed in this vicinity, but watch will be kept for it and, if discovered in its nefarious work, recommendation will be made of the best way to meet it.\*

\*In a communication made to the COUNTRY GENTLEMAN of May 7th, 1891, and copied in my Eighth Report on the Insects of New York, some larvæ on apple twigs, received from Wayne county, in the western part of New York, were identified by me as *Psylla pyri*. They were thought to be identical with larvæ that had been sent to me a few days earlier, on apple blossom buds, from Ghent, Columbia county, N. Y.

The above identification should not have been made, or doubt should have been expressed, for, from having had only the larvæ before me, it is by no means certain that they may not have belonged to some other species, as *Psylla mali* or *Ps. pyrisuga*. It is sufficiently difficult to distinguish these *Pyrus*-infesting *Psyllids* in their final winged stage.

Early in June, in a visit made to the orchards of Mr. Cole, at Catskill, Greene Co., N. Y., to observe the attack of the pear midge, which had just been brought to notice (see *Eighth Report Insects of New York*), it was learned that the pear *Psylla* had been extremely abundant with him for the preceding four years, and had seriously affected the bearing of his trees. That they had been very numerous was evident from the appearance of some of the larger trees, the terminal branches of which looked as if they had been coated with a black paint. A few of the insects were observed at this time on the wing, but, later in the year, according to Mr. Cole, clouds of them would rise up in the air if a limb was shaken. The branches would be so covered with honey-dew as to smear the hands and sleeves of the men gathering the fruit.

About the middle of June the insect was seen prosecuting its destructive work at Ghent, Columbia county, N. Y.: in the extensive orchards of Mr. G. T. Powell, larvæ, pupæ, honey-dew, and the winged insects abounded. Of the latter a dozen or more could be seen at one time feeding from the foot-stalks of a leaf or young pear, extracting its sap, and, of course, producing blight. If a small tree was shaken, thousands would take wing, circle about the branches for a short time, and then again settle upon the leaves. A correspondent of the *Rural New Yorker*, who visited the orchards of Mr. Powell in August, has given the following sad account of their appearance :

From the beautiful apple orchards we strolled to the pear orchards, and here was a sight to make one cry. He has about three thousand pear trees, half of them in full bearing, but a pest has struck them this season, which has made the orchards a picture of desolation. Last year the pear-tree *Psylla* appeared, but were not numerous enough to do any appreciable damage. This season they reappeared in force, and have converted his beautiful orchards into a most distressing scene. Mr. Powell's most vigorous efforts, seconded by the wisdom of the State Entomologist, were powerless to check the ravages of this pest, though they hope another season to be more successful. Possibly the pests may not reappear another season, as they come and go mysteriously. But they have done their work most effectually this season, and instead of twelve hundred barrels of fine pears which he had counted on, he will barely have one hundred. (*Rural New Yorker*, August 29th, 1891, page 624.)

Similar conditions presumably prevailed in a large number, if not in most, of the pear orchards of Greene and Columbia counties, judging from other reports that came to me.

A severe attack was also reported, in June, by Professor C. H. Peck, on some young pear trees in his garden, at Menands, in Albany county. It continued through the summer into the autumn, causing considerable damage to the foliage of the infested trees.

### Distribution.

As already stated, the pear-tree *Psylla* is known to have occurred at Salisbury, Conn., in 1833, and it was probably operating in an eastern county in New York in 1824. At the time that Dr. Harris wrote of it—in 1852—it was known to him “in the western part of Connecticut and Massachusetts, particularly in the valley of the Housatonic, and in the adjoining counties of Dutchess and Columbia in New York.”

Little is known of the extent of its eastern distribution in the New England States. Mr. T. S. Gold found it “several years ago” in West Cornwall, Conn., ten miles south-east of Salisbury. Coe Brothers first noticed it in their pear orchards at Meriden, New Haven county, Conn., ten or fifteen years ago, where it has been quite destructive in certain years. Mr. Fisher has had the opportunity of studying its habits at Fitchburg, in northern Massachusetts, nearly one hundred miles from Salisbury. That it is rather a local insect would appear from the statement that it is not known to the Messrs. Coe in any other portion of the State, and furthermore, that it has not appeared in a young pear orchard (set out in 1881), which is only a half-mile distant from their badly infested orchards.

Along the Hudson river valley it has been injurious in Rensselaer, Columbia, Dutchess, Greene, and Albany counties. Its presence has not been reported in the extreme south-eastern counties of New York, nor is it known to Dr. J. B. Smith to occur in the State of New Jersey.\* In Central New York, Mr. M. V. Slingerland has been able to make valuable studies upon it at Ithaca, Tompkins county. In Western New York it must occur sparingly, if at all, for Mr. E. P. Van Duzee, who has been giving careful study to the Hemiptera for several years past, reports “no observed injury from it,” nor is he able to identify the species, as described in Dr. Loew’s paper, among the seventeen species of *Psyllids* contained in his collection. Professor A. J. Cook does not know of its presence in Michigan. Professor F. M. Webster has found it abundant in Ohio; and Dr. LeBaron has written of its presence and injuries in Illinois.

### Its Injuries.

The injuries resulting from formidable attacks of this insect are the consequence of the large amount of sap which the myriads of individuals draw from the twigs, buds, leaves, leaf-stalks, and fruit-stalks of an infested tree, and eject in the form of “honey-dew,” thickly coating the surface and thereby preventing the normal vital action of the leaves and bark.

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\* It has since been observed in New Jersey by Dr. Smith.

Some of these injuries have already been referred to, as in the orchards of Mr. Powell, in Ghent, N. Y. The extensive pear orchards of Coe Brothers, at Meriden, Conn., have for several years suffered severely from it. In a letter from Mr. A. J. Coe, dated September 7th, 1891, he wrote that on his return from Europe, a few weeks previous to his writing, he found that his pear orchard had been devastated by the *Psylla*, and bore very little fruit.

A severe attack prevailed in a pear orchard of Mr. H. S. Wright, of Ithaca, N. Y., during the season of 1891. Mr. Slingerland, who saw the orchard in November of that year, has reported of it as follows: "The whole orchard appeared as though a fire had swept quickly through it, scorching the trees and blackening the trunks, large branches and the smallest twigs. Both young and old trees of dwarf and standard varieties had been attacked. Most of the trees had made little or no new growth during the season, and many buds were then dead."

Dr. LeBaron has described severe injuries from it in the State of Illinois, in the year 1871, when young pear trees had been so badly attacked by it that "the leakage of sap from the axils of the leaves [? the honey-dew given out by the insects] had in some instances run down the branches and trunk to the ground."

The frequent death of pear trees in former years, from unknown causes, after a season of languishing, is now believed to have been owing to the unsuspected presence of this insect, which from its minute size may have easily been overlooked. Mr. Powell unhesitatingly charges the recent death of many of his trees to *Psylla* attack. Certain it is, that a continuance for several years in succession of such injuries as have been cited, must necessarily prove fatal to the trees. If not carried to this extent,—in years of abundance of the *Psylla*, the crop would be a failure. The leaves, covered with a thick coating of the honey-dew and the sap withdrawn from their foot-stalks, would cease in midsummer to perform their functions and would fall to the ground: without them, the fruit could not mature.

#### Life-history.

There was not the opportunity during the season of 1891 to make a study of the life-history of this insect, or to learn much more of it than what has been given in the preceding pages. The following year, its abundance at Ithaca gave to Mr. Slingerland the opportunity of watching its development and habits; and in a Bulletin (No. 44) issued by the Cornell University Agricultural Experiment Station, under date of October, 1892, he has given to the public its entire life-history carefully worked out, together with its early history, descrip-

tion and illustrations of the several stages, methods of preventing its ravages, together with its bibliography and synonymy.

Whether or not, eggs of the pear-tree *Psylla*, are, in some cases at least, deposited in the autumn for hibernation, seems still an unsettled question.

Mr. Slingerland found a hibernating brood of the winged insect, in both sexes, in the month of December, hidden in crevices under loosened bark of the trunks and larger branches of trees. The females contained no mature eggs. During some warm days occurring about the 7th of April, hibernated adults were seen in copulation and a few eggs were laid. By April 18th, most of the eggs had been deposited — in crevices of the bark, in old leaf scars, and about the

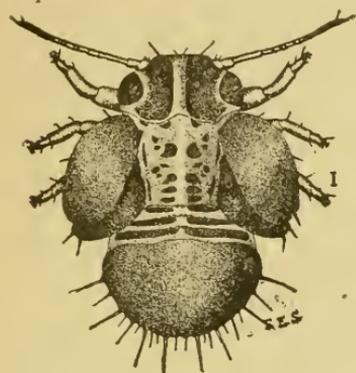


FIG. 12.—Pupa of the pear-tree *Psylla*, dor: sal view.

bases of terminal buds of the preceding year — usually singly, but sometimes in rows of eight to ten. Under a continuance of cold weather, the eggs did not hatch until more than a month thereafter, or May 10th to 18th, but eggs that had been removed and subjected to the warm temperature of the Insectary, gave out their larvæ in eleven days. The larvæ at once resorted to feeding grounds which were usually found in the axils of the leaf petioles or stems of the young fruit, into which they thrust their short

beaks and extract the sap. “The whole life-cycle of the generation studied, from the laying of the egg to the appearance of the adult insect, was about one month” [in the Insectary].

During this time, five stages — “nymph stages” — of the immature insect were observed, followed by the fifth molt giving the winged adult. [If it be preferred to retain a “pupal stage” for the insect, the last two of the above noted may be so regarded, in which there are eight antennal joints, while the preceding show but three, four, and six or seven respectively, according to Mr. Slingerland’s observations.] Figures 12 and 13 represent the full-grown “nymph” or pupa — the natural size indicated by the accompanying hair-lines.

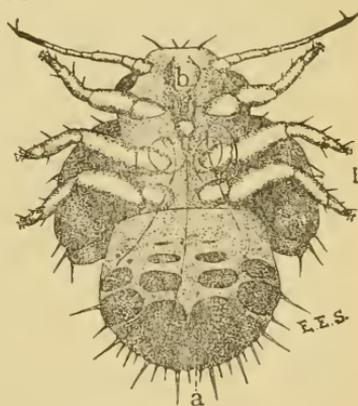


FIG. 13.—Pupa of the pear tree *Psylla*, ventral view.

The mature insects made their appearance about June 15th, and commenced to feed soon after emerging. "They appear to secrete no honey-dew." Within a week copulation ensued, and oviposition soon began. There were at least four broods during the year, at intervals of about a month. The adults of the summer broods were the most numerous July 20th, August 20th, and September 25th—the last constituting the hibernating form.

This last-named form varied so much from the preceding summer broods, being one-third larger and of much darker colors, that they were believed, at first, to be a different species. On careful comparison with descriptions of *Psylla simulans* Foerster, of Europe, it was found to present so close a resemblance as to leave scarcely a doubt that *P. simulans* had been described from the winter form of *P. pyricola*, and that the species is dimorphic, appearing in two distinct forms during the year, as some others of the Psyllidæ are known to do.

The *P. simulans* form continues to feed until the leaves fall, when it retires to its hiding places for the winter. None were observed in copulation during the autumn.

For descriptions of the insect in the several stages, the paper of Mr. Slingerland may be consulted.

*Eggs of the Psylla.*—Among the few notes made by me during the prevalence of the insect in 1891, the following occurs:

Prof. C. H. Peck, brought from his garden at Menands, N. Y., on June 15th, leaves of a pear tree having numerous eggs of the Psylla on both the upper and lower sides, but rather more abundant on the lower side. Many are placed along the midrib from the base to the tip, and some on other parts of the leaf, usually beside a vein and thrust in almost out of sight between the twisted hairs clothing the surface. The hair-like thread projecting from the narrow end of the egg, is, in



FIG. 14.—Egg of the pear tree Psylla.

most, a little longer than the egg, but in some, twice the length. The egg is not attached by it to the leaf but by a transparent teat-like process given off from

near the broader end, as shown in the accompanying figure. Three eggs were seen standing close together on a leaf with the thread pointing upward, as if it were the remains of the secretion in which the eggs were enveloped at their oviposition.

Nearly all of the eggs are near their hatching as the inclosed larvæ are seen within, separated from the shell. On one leaf there were about thirty eggs. Young larvæ, apparently disclosed within a day or two, were also present. Cast pupa-cases were attached to various portions of the leaves. Professor Peck noticed the adults mating when the leaves were gathered.

### Remedies.

Recent writers upon this insect have been recommending as perhaps the best method for its destruction, that of killing the eggs in which the insect was believed to hibernate during the winter, by spraying them with kerosene emulsion. This was based, not on actual experiment, but on the known insecticidal property of kerosene and its penetrative powers. Late experiments, however, carefully made, have given the unlooked-for result that there are insect eggs which can not be killed by kerosene emulsion of the extreme strength with which it may safely be used on vegetation, or even by undiluted kerosene. Such are the eggs of the *Psylla*, as has been shown by Mr. Slingerland in his *Bulletin on the Pear-tree Psylla* previously quoted. It was found by him that eggs dipped in a kerosene emulsion of full strength, and into kerosene undiluted, hatched a few days thereafter. The same result attended their immersion in spirits of turpentine, carbolic acid emulsion, whale-oil soap solution, strong potash solution, and undiluted benzine.

The vulnerable stage in this insect is when it has hatched from the egg and the larvæ are distributed over the young leaves and on the leaf stalks. This, in ordinary seasons, in the State of New York, would be about the middle of May. If the infested trees are at this time sprayed with kerosene emulsion, even so weak as five per cent of kerosene, it will be fatal to all the insects with which it comes in contact. With careful spraying very few should fail of being reached, unless they are protected by a covering of honey-dew.

When the insect has passed to its winged stage, it has attained comparative immunity in the alertness with which it takes wing and leaves the tree upon the first motion communicated to the foliage by the impact of the spraying liquid. But even so late as the month of September, the war against the insect should not be abandoned, for multitudes may be destroyed, and the hibernating individuals for the following year greatly reduced. The kerosene emulsion will still be effective, but in its application, all of the ordinary spraying-nozzles should be discarded, even the finest gauge of the Nixon nozzle, and a Vermorel used, adjusted to the delivery of the finest possible mist-like spray. With proper care the emulsion may be distributed over the entire foliage without scarce stirring a leaf and with the least possible alarm to the winged tenants. Of those that take wing — after circling about the tree for a while — on their return to the leaves, their bodies will in most cases come in contact with the liquid, and take up sufficient of it to cause their death.

**Chortophaga viridifasciata** (De Geer).*The Green-striped Locust.*

(Ord. ORTHOPTERA: Fam. ACRIDIDÆ.)

Additional to Bibliography given in Second Report, Insects of New York:

- Tragocephala viridifasciata*. RILEY: in 1st Rept. U. S. Ent. Commis., 1878, p. 256 (quotes from 8th Rept. Ins. Mo.); in Cassino's Stand. Nat. Hist., 1884, p. 203, fig. 285 (range).
- Chimarocephala viridifasciata*. SCUDDER: Entomolog. Notes, vi, 1878, p. 30 (collections in Florida).
- Chimarocephala viridifasciata*. LINTNER: 2d Rept. Ins. N. Y., 1885, pp. 187-198, fig. 54; in Count. Gent., lvii, 1892, p. 286 (at Canaan Four Corners).
- Chortophaga viridifasciata*. FERNALD: Orthop. New Engl., 1888, p. 40, fig. 15 (the two forms).
- Chortophaga viridifasciata*. COMSTOCK: Introduc. Entomol., 1888, p. 98 (stridulation), p. 104 (varieties).
- Tragocephala viridifasciata*. WEED: in 15th Rept. Ins. Ill., 1889, p. 42 (early appearance in Illinois).
- Chortophaga viridifasciata*. MCNEIL: in Psyche, vi, 1891, p. 62 (habits, etc.).
- Chortophaga viridifasciata*. BLATCHLEY: in Canad. Ent., xxiii, 1891, p. 76 (habits).

Young individuals of this locust (commonly called grasshoppers) were received from Canaan Four Corners, Columbia county, N. Y., where they had excited surprise and alarm by their having been seen in large numbers, on March 30th, hopping about on the snow and elsewhere in pastures and meadows having a warm southerly exposure.

**Identification of the Species.**

A notice of this occurrence was published in the *Country Gentleman* of April 14th, 1892, in which they were recognized as the young of "the green-striped locust," which had been described by Dr. Harris in his "Insects of New England" as *Locusta (Tragocephala) viridifasciata*. In my Second Report (*loc. cit.*) an account is given of this insect under the generic name of *Chimarocephala* — a name proposed by Mr. Scudder, in 1876 (meaning in the Greek, goat-headed) to replace the preoccupied one of *Tragocephala*. It has since been referred to the genus *Chortophaga* by Saussure, and this designation appears to have been accepted by our later scientific writers. It hardly seems worth the while, however, to attempt to follow the frequent generic alterations to which many of our insects are subjected.

**Its Frequent Winter Appearance.**

This particular species of locust seems, in its young stage, to respond more quickly to the influence of warmth in emerging from its winter retreat than any other of the species which, like it, hibernate in their larval stage, as *Arphia sulphurea* (Fabr.), *Hippiscus tuberculatus* Pal. de Beauv, species of *Tettix*, et cet. Its proneness to premature appear-

ance has been remarked upon by several writers. Dr. Riley having received examples of it in Missouri, which were observed hopping about during mild weather in midwinter, has written of it: "It becomes active whenever the weather is mild. It is sometimes found in winter in the early larva stages, but more often in the pupa state."\* Dr. Thomas has stated: "The larvæ and the pupæ and even the perfect insects are occasionally observed during the warm days in winter."† Mr. Weed (*loc. cit.*) saw them in Peoria county, Illinois, in the month of March, 1886, "hopping around on the grass, although the ground in many parts of the field was covered with snow." Mr. Blatchley records them as "frequenting dry open woods and roadsides, where the half-grown young can be seen jumping vigorously about in any warm sunny day in winter." In my Second Report (*loc. cit.*) record is made of their occurrence in several localities in the State of New York during the winter of 1882, in the month of February, in immense numbers — millions as stated by some observers — jumping about on the surface of the snow with all the life and activity of midsummer. That a temperature of about fifty degrees above zero, Fahr., will usually bring out the insect from its winter quarters, may be inferred from the following data: Of the thermometrical conditions attendant on the February (1882) occurrences in the State of New York, I have written: "From an average temperature for the several preceding weeks of  $+27^{\circ}$  Fahr., it suddenly changed to a mean temperature (of one week) of  $40^{\circ}$ , reaching at the highest,  $56^{\circ}$ ." Almost the same conditions seem to have attended the appearance at Canaan Four Corners above reported: Thus, the average temperature of the week preceding March 25th, as given in the "Report of the New York Meteorological Bureau" for the month of March, for Albany, the nearest reporting station to Canaan Four Corners, was  $+28\frac{1}{2}^{\circ}$ ; that for the week following (25th to 31st),  $40^{\circ}$ ; the highest temperature observed,  $57^{\circ}$ , on the 26th.

#### The Two Forms of the Insect.

A description of *C. viridifasciata* has been given in the *Second Report on the Insects of New York*. Figure 15 represents the full-grown insect, and its larva in form and size as usually seen during the winter. The dimorphic forms under which it appears are quite marked. They have been thought by some



FIG. 15.—The green-striped locust, *CHORTOPHAGA VIRIDIFASCIATA*, young and adult.

\* *Eighth Report on the Insects of Missouri*, 1876, page 149.

† *Eighth Report on the Insects of Illinois*, 1880, page 106.

to be sexual features and by others as seasonal varieties. "In one, the typical form, the head, thorax, and femora are green, and there is a broad green stripe on each wing-cover, extending from the horn to beyond the middle: this often includes two dusky spots on the edge. The second variety differs so much that it was described by Harris as a distinct species under the specific name, *infuscata*. In this form the ground color is dusky brown. Intergrades occur in which the head and thorax are of a reddish velvety brown. Length of male to end of abdomen, 20 mm. (.8 inch); to tip of wings, 25 mm. (1 inch). Length of female to tip of wings, about 30 mm. (1.4 inch)." (Comstock.)

#### Transformation, etc.

This species has been shown from reliable data to be double-brooded, unlike our common red-legged locust (*Melanoplus femur-rubrum*), the Rocky Mountain locust (*Melanoplus spretus*\*), the lesser locust, *Melanoplus atlantis*, and most of the other *Acrididæ*, of which there is but one brood annually. It is to this fact in its life-history that its not infrequent appearance in winter or early spring may be ascribed.

The insects received from Columbia county are immature, being in their early stages of larvæ and pupæ—the latter distinguishable by their somewhat larger size (over half an inch) and possession of wing-pads or wing sheaths containing the future wings. They are from the egg-pods that were deposited in holes made in the ground by the ovipositor of the females last autumn. The larvæ hatching from the eggs two or three weeks thereafter, fed for awhile, until they had attained the size that they now present, when the coming of cold weather drove them to shelter for the winter in rubbish, beneath leaves, and in stone walls. Here they remained in an inactive, lethargic state, until unusually warm weather toward the last of March awakened them from their sleep and enticed them abroad.

The insect becomes fully matured, and takes its place among the earliest harbingers of spring, ordinarily toward the latter part of May. It has been seen by Mr. McNeil for the first, on the 22d of April, and he has pleasantly written of it: "This species is the first of its order to reach maturity in the early spring, and the noise of the male [it has remarkable stridulating powers] is the beginning of the grasshopper chorus which continues for six months to come."

#### Its Early Appearance Should not Excite Alarm.

Occurrences of this kind—the premature appearance of an insect associated in most minds with the warmth and heat and abundant vege-

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\* *Caloptenus spretus* of the earlier New York Reports.

tation of summer — never fail of exciting apprehension of its unusual abundance later in the year with serious injury to the grass crop. Such fear, however, need not be entertained. Large numbers of these locusts, in their tender and helpless condition, become the prey of black birds that come in flocks in the month of April, and feed eagerly upon them, aided in their work by others of our early appearing feathered friends. Furthermore, it is more than probable that this premature coming forth really serves to lessen prospective injuries from the brood, for the cold rains and frosts of early spring can not fail of killing a large proportion of those that are thus prematurely abroad, before they could find fitting shelter, even if they are endowed with the instinct in this phase of their life to seek it.

#### The So-called Grasshoppers are Locusts.

I have referred to these insects as *locusts*, for by this name the so-called “grasshoppers” should be known. The true grasshoppers are pale green, unicolorated creatures, with long legs, and long thread-like antennæ projected from their heads, of the katy-did type. There is a lamentable confusion in the common names of these Orthoptera, as when we speak of the “17-year locust” which is not a locust, but a cicada, and belongs to quite a different order of the Insects from the Orthoptera, viz., the Hemiptera. It is always hard to correct long standing popular errors, and it would be foolish to attempt it in cases like the above, were it not that there are always those — albeit a small minority — who would prefer to call things by their right names.

#### Distribution of the Insect.

This species has an unusually extended range over the United States. According to Scudder, it occurs “from the White Mountains to Key West, Florida, Texas, and westward into northern New Mexico, and southern Colorado; also in Guatemala. It is found in Iowa, Minnesota, and Nebraska (Thomas). It probably occurs in all the States east of the Rocky Mountains, although Mr. Lawrence Bruner, of the Nebraska Agricultural Experiment Station, has not included it among the forty-eight species of locusts observed by him in his Locust Examinations in the valley of the Yellowstone river in eastern Montana and northwest Dakota in 1885.\* In reply to an inquiry made of Mr. Bruner of its western distribution, he has kindly written:

“I have taken the *Chortophaga viridifasciata* as far west as the Rocky Mountains of Colorado and New Mexico; and I believe that it occurs also in Utah. I know that it is found in the Black Hills, S. Dakota,

\*Annual Report of the Department of Agriculture for the Year 1885, p. 307.

and also in the Platte river bottoms in Wyoming. These Rocky Mountain specimens are all of the darker form — *infuscata*. Here in Nebraska we have both the green and the brown, and find them in about equal numbers. It is a very common insect along all our streams and at the edges of natural and artificial groves. It is especially common on south hill slopes early in spring.”

It probably does not extend to the Pacific coast, for Mr. Coquillet has enumerated eighteen species observed by him in the San Joaquin valley, California, in 1885, but this species is not mentioned among them.\*

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\* *Annual Report of the Department of Agriculture for the Year 1885, page 297.*

## NOTES ON VARIOUS INSECTS.

### *Eriocampa cerasi* (Peck).

#### *The Cherry-tree or Pear-tree Slug.*

As this common insect has not been noticed in this series of reports, a few words in relation to it may be convenient for reference. They were written in response to the following inquiry from Orange, N. J.:

For a few seasons past some of our pear trees have been badly damaged by numerous slugs which adhere to the upper sides of the leaves and devour all the spongy portion. These pests, a sort of flesh-colored snail, appear in great numbers soon after the leaves have attained their full size. Last season some of our trees were defoliated three times by these little pests. Consequently the trees made only a partial growth, and those that produced fruit were damaged to such an extent that the fruit did not attain half the usual size. Is there a remedy?

The pear-tree slug, the ravages of which are told in the above communication, is a well-known fruit-tree pest, occurring on the pear, cherry, plum, and quince, and also at times on the mountain ash. It was described under the name of *Scandria cerasi* over a hundred years ago by Professor Peck, of Massachusetts, in a little pamphlet, for which a gold medal and fifty dollars were awarded by the Massachusetts State Agricultural Society.

The parent fly is a four-winged hymenopterous insect, of a glossy black color, with transparent wings, with the exception of a dusky cloud crossing the front pair. It is one of the "saw-flies," and bears the scientific name of *Eriocampa cerasi* (Peck), and is represented in Figure 16.



FIG. 16.--The cherry-tree slug, *ERIOCAMPA CERASI*, enlarged.

The female appears in the early part of June, and deposits her eggs singly in incisions made in the leaf, either on the upper or the lower side. The eggs develop into slugs in about two weeks time. Their slimy and disgusting appearance is too familiar to fruit-growers to need description. In the month of August, a second brood of the slugs make their



FIG. 17.—The pear-tree slug, in natural size and enlarged.

appearance, which feed for about a month, and are frequently more destructive than the first brood. The slug is shown in natural size upon the leaf, and in enlargement beside it, in Figure 17.

The insect is regarded as only two-brooded in Canada and in the Northern United States. Possibly there may be occasionally three broods in New Jersey, but it is not improbable that the supposed third brood may have been belated individuals of the second, as some of these do not develop the winged insect until September and even in October, while others pass the winter in the pupal state.

*Remedies.*—This insect is not a difficult one to destroy. Powdered hellebore has long been a favorite and satisfactory remedy for this and all other of the slimy slugs. It may be distributed over the foliage in powder, or, if more convenient, it may be mixed in water in the proportion of one ounce to two gallons of water, and applied with a force-pump. Spraying with Paris green and water would doubtless be equally effective, as the slugs feed upon the parenchyma from the upper side of the leaves. Powdered lime is also excellent for killing the slugs, when thrown by hand or otherwise over the leaves. A few years since, a young pear orchard in Western New York was severely attacked by a species of slug, allied to the *E. cerasi*, but apparently an uncommon insect, as appeared from examples sent me which I was unable to name. Request was made for additional specimens from which to breed the perfect insect, but answer was returned that the orchard had in the meantime been gone over with air-slaked lime, and no more of the slugs could be obtained.

Road dust has also been employed as a remedy, as almost any fine powder will kill the slugs by adhering to their viscid surface and closing the breathing-pores, unless they should be near one of their molting stages at the time, when the skin would be cast off and the dust inoperative.—(*Country Gentleman*, for May 19th, 1892.)

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### Papilio Cresphontes (Cramer).

#### *The Yellow-banded Swallow-tail.*

A number of the larvæ of this beautiful butterfly were received from Mr. Wm. Falconer, of Glen Cove, Long Island, on October 18th of this year, with the following notice of their occurrence: "I send you a few larvæ that I found on a bush of *Choisya ternata* — a Mexican shrub that I set out, in summer, and take in, in winter. I first noticed them two or three weeks ago. There were a great many of them on

the bush then, but since a week or ten days many of them have disappeared: a few, but not nearly all of the missing ones, are on the ground, dead. They did not occur on any other shrub, although there were a hundred species of shrubby plants near by."

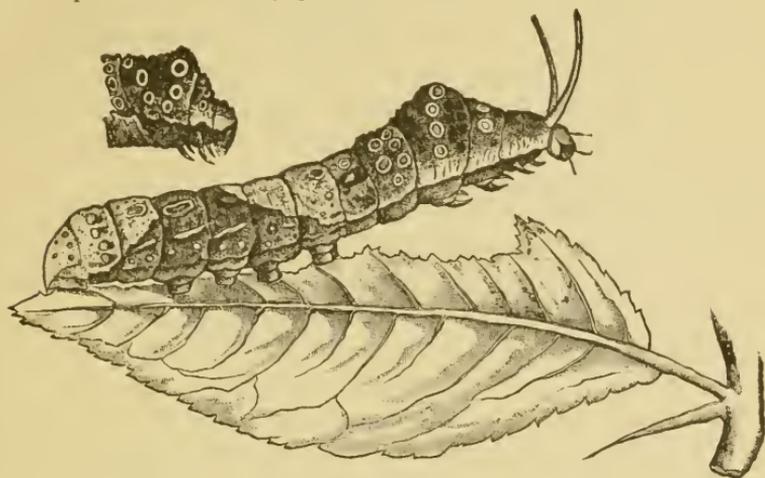


FIG. 18.—The caterpillar of *PAPILIO CRESPHONTES*, in natural size.

Mr. Falconer further stated, that a gentleman whose attention had been called to the larvæ, identified them with some that had occurred in his garden at Creedmore, L. I., a few years ago on a *Fraxinella* (*Dictamnus fraxinella*) bush, but on nothing else. Both the *Choisya* and the *Dictamnus* belong to the family of *Rutaceæ*.

Other known food-plants of the larva are prickly-ash (*Xanthoxyllum*), hop-tree (*Ptelea*), orange, lemon, and others of *Citrus*—all pertaining to *Rutaceæ*. The larva is represented in its mature size, and in contraction of its anterior segments, in Figure 18.

*Papilio Cresphontes* is a southern species, ranging from the northern part of South America, northward. It has gradually extended its range until now it occurs as far north as the vicinity of Montreal in Canada. The first record of its appearance in the State of New York was in 1864. Within late years, from being an occasional visitor, it seems to have established itself in Westchester county, and at Poughkeepsie. In other localities in the State it is occasionally abundant, as in Rochester, where, according to Mr. Bunker, it "swarmed," one season, several years ago. Professor L. M. Underwood has written me that on September 12th, 1882, he saw several examples flying over the low swales near the Rhinebeck and Connecticut railroad in Columbia county. It has not been observed in the neighborhood of Albany. A single example was taken at New Baltimore, seventeen miles south of Albany, in the month of September.

**Podosesia syringæ (Harris).***The Syringa Borer.*

This beautiful moth is generally so rare that it remains a desideratum in the collections of some of our earnest collectors. That it may, at times, multiply to an inconvenient extent is shown from a letter received from Mr. John L. Lockwood, of New York city, who, sending examples of the larvæ in their burrows for identification, asks for some method by which he may arrest the attack, as all of his lilacs are being destroyed.

Possibly the insect is becoming more numerous, since, no longer confining itself to Syringas, it is multiplying in ash trees. Dr. Kellicott has "watched twenty or more [of the moths] emerging from an [ash] tree in a single day; and often a hundred or more were in a single tree." This was in Buffalo (*Entomologica Americana*, i, p. 177). Rev. Mr. Hulst records it (*Bull. Brooklyn Entomolog. Society*, v, 1882, p. 17) as so abundant in the English ash, in Brooklyn and the vicinity, that the tree is being rapidly exterminated. He had seen trees which were "completely riddled with the holes made by the larvæ and had died from the effects." Professor H. Osborn has also observed the larvæ boring in young shoots of ash trees, in Ames, Iowa. It appears to be a local insect, as are also several of the *Sesiadæ*.

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**Carpocapsa pomonella (Linn.).**
*The Codling Moth.*

A correspondent from Malcom, Seneca county, N. Y., Mr. Malcom Little, writing November 4th, has sent a section of an apple containing a larva within its burrows, with the statement that it has done great damage to apples this autumn, in that, while not penetrating deeply, it greatly disfigures the fruit.

The calyx end of the apple received, had been eaten out into irregular open channels filled with rounded black excremental pellets, extending in one direction to more than a half-inch from the center of the calyx, but not penetrating deeper than its base. The calyx has the moderate depression of three-tenths of an inch below the apex.

The larva is at this time, November 6th, apparently full grown and quite sluggish in its movements, as if about to prepare for pupation. In its pink color and structural characters, I find no difference in it from the ordinary apple-worm of the codling-moth.

Dr. Harris has stated, that upon the hatching of the eggs "the little apple-worms or caterpillars produced from them immediately burrow into the apples, making their way gradually from the eye towards the core." In this he has [until recently as will be hereafter noticed] been followed, without qualification, by all our other writers, so far as I recall them, and all our illustrations show such a mode of procedure.

The feeding, to maturity, of the caterpillar in the apex of the apple, had never come under my observation before, and it seems to be quite new to Mr. Little, although he has long been engaged in growing fruit. Possibly it may not be uncommon, and may even frequently occur, when in the second brood of moths the eggs are deposited after the fruit has attained such a size and position on the tree that the "downward" direction that at first leads to the core would no longer guide the larva thither, but rather confine it to the apex. And at this time, the seeds, for which it shows a particular fondness, may be so far removed from it as to have lost their power of attraction. Later, it was learned from Miss Little, upon inquiry, that the section of apple sent was from a Rhode Island Greening, but that "the same trouble was common in all kinds of apples this fall." It was further stated that in several instances, the burrows were at the stem end, and occasionally one would be found where the skin on the side was affected in the same manner for a space not larger than a five-cent piece, and to a very slight depth. A few apples had been seen in which both the calyx and stem ends had been burrowed, with the core and parts surrounding, intact.

It would, therefore, appear that the second brood of larvæ not infrequently operate upon the fruit near its surface without penetrating to its interior. It would be of interest to learn to what extent this occurs.

Mr. P. C. Lewis, of Catskill, N. Y., has kindly permitted me to copy a portion of a letter addressed to him, from a correspondent in Tasmania, who, having the agency for the sale of his force pumps for spraying purposes, has given studious attention to the life-history and habits of the codling-moth. The habits of the insect, in the antipodes, as given, are so different in several respects from those observed elsewhere, that the letter will be read with interest:

I do not see why the codling-moth should operate here so differently from what it does in your country, but it does, most decidedly. Perhaps it would be best to simply state my experience or the mode of operation here, and then you can note the differences.

The moths emerge from the chrysalids from middle of November [corresponding with our May] to March, and *deposit their eggs promiscuously* — in the eye — on the side — on the stalk — where two apples

touch (a favorite place),—in short, there is no rule, but perhaps, if the weather is wet, a larger percentage are in the eye. They strike [lay the egg] from the time that the apple is of the size of marbles until they are full-grown: this must be self-evident, from the long period during which they strike— from November to March.

In about a month the larvæ mature, leave the apple, seek shelter, spin a cocoon, and *lie in the larva state* until about October or November [April and May in New York], when they change into the chrysalis, and emerge as moths, as before stated.

There are some who hold that there is more than one generation, but that is contrary to my experience. If it is so, it is the exception and not the rule. I am constantly removing bandages from January to June, and have never found, in a single instance, a chrysalis or the empty case, but larvæ by the hundreds. I have also experimented with larvæ under cover, taken from the apple as early as possible, and they have not emerged until December.

I am strongly of the opinion that spraying should be commenced early— when the calyx of the apple is up, because I find that after the fruit has been struck in the eye, spraying is not effectual. The pear is chiefly struck in the eye. The apples most liable to attack are the Ribstone, Alexander, Dutch Mignon, Imperial Green, Russets, and Victorias. In some places, the apricot, peach, plum, cherry-plum, and even some cherries, are affected.—W. N. Cressy, Feb. 13, 1891

Referring to the habit as above given, of the promiscuous egg-laying of the moth in Tasmania, upon any part of the fruit, and even on the stem, it is safe to say, that it is opposed to all observations made in this country.

Mr. L. O. Howard, in his extended account of the Codling-Moth, contained in pages 88–115 of the *Report of the Commissioner of Agriculture* for 1887, has aimed to give a complete account by bringing into one readily-accessible article a review of the life-history of the insect, and to this end, all of its literature, so far as known, was consulted and gleaned. According to this: “In the little crumpled-up spot caused by the falling off of the calyx the eggs are hidden, sometimes two or three to a single apple or pear. The eggs are laid sometimes upon the smooth cheek of the apple and sometimes in the hollow at the stem, but these are both unusual.” From this statement we may conclude that an egg of the codling-moth deposited elsewhere than in the eye of the apple is, in this country, exceptional and of rare occurrence or, at the least, has not been frequently observed.\* Probably the same rule would apply to the oviposition in Europe.

In a paper read before the Conference of the Fruit and Vine-growers of New South Wales, Australia, in June, 1890, by J. H. Dickenson, of South Bridgewater, Tasmania, based apparently on his personal observations, we read as follows: “The moth lays her eggs in the eye

\* This will require qualification in view of observations since made, in Maine, by Mr. Munson, on the second brood of the insect, and given on the following page.

of the apple in the first part of the season, but later-hatched ones lay their eggs on the side of the apple as well as in the eye."

Accepting, therefore, as a fact, that in Tasmania eggs are *frequently* placed on the body of the apple, may not the explanation be found in the insular limitation of Tasmania, comparatively a small area of orchards, and such an abundance of the insect under conditions highly favorable to its multiplication, as to render it almost impossible for the moth to find an apple the blossom end of which has not already received an egg or two, and therefore compelled by instinct to resort to the side? Professor Riley has found that, in an instance where several moths were confined under a jar with a single apple, that in a few days it was fairly riddled with young larvæ.\* The eggs had no doubt been placed at random, anywhere on the apple. In Tasmania, the codling-moth had been a notorious pest for many years—at least thirty—before its introduction into the Australian colonies.

The latitude of Central Tasmania is about equal, in degrees from the equator, to that of Central New York.

A recent publication by W. H. Munson, Horticulturist of the Maine State College Agricultural Experiment Station,† shows that the apple worm enters the fruit much more frequently from other points than at the calyx than had been hitherto supposed. He states: "The objection has been raised by some of our fruit-growers that a large proportion of the affected fruit is entered from side or base, and consequently that spraying before the fruit turns down has no special merit."

The following result is extracted, in condensed form, from a table given by Mr. Munson, from the examination of six trees of Rhode Island greenings, four of which had been sprayed twice with one pound of Paris green in 250 (in two trees) and 310 gallons of water.

The four sprayed trees gave 346 wormy apples, of which 133 (=38.5 per cent) had been entered from the calyx, and 213 (=61.5 per cent) from the side or base.

The two unsprayed trees gave 449 wormy apples, of which 252 (=56.1 per cent) had been entered from the calyx, and 197 (=43.9 per cent) from the side or base.

Of the entire number of wormy apples on the six trees, more than one-half (51.5 per cent) had been entered from the side or base.

This large proportion may probably be accounted for by the statement made by Mr. Munson, that "a large proportion of the fruit

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\* *Report of the Commissioner of Agriculture for the Year 1887*, page 91.

† *Annual Report of the Maine State College Agricultural Experiment Station for 1891-1892*, page 105.

infested had been attacked by the second brood, and the larvæ were still present" when the examination was made.

Possibly the second brood may have been unusually abundant. The trees had only received the June sprayings.

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### **Dynastes Tityus** (Linn.)

*As a Fruit-Eater.*

In the notices of this insect — the Rhinoceras beetle, or the Spotted Horn-bug, as it is popularly called — in the 5th and 7th Reports of this series, the ash was given as the food of the beetle — either the tender leaves of young shoots, the alburnum or sap-wood of the limbs from which the bark has been planed, or the sap which it has caused to flow. It has never been recorded as injuring fruits.

An example of the beetle — a male — was received October 4th of the present year (an unusually late period for it) from Mr. F. H. Emmord, of Magnolia, Md., with the memorandum, "came off a ripe pear." As its occurrence on the pear might have been simply accidental, it was inclosed in a box with a ripe seckel to see if it would feed upon it. The day following it was found with its head and thorax buried in the pear. In the meantime, Mr. Emmond had been written to, asking him if the insect had eaten into the pear from which it had been taken, and if any instances of its feeding on fruit had been observed by him. The answer returned, was the following:

"I found the spotted horn-bug in a soft, ripe, seckel pear which he had eaten into quite to the core. I had laid the pear in a crotch of the tree the day before. I put him in a paper box with a piece of the same pear which he ate. Where the juice of the pear had softened the paper box he ate through it."

As the beetle also in like manner ate through the saturated bottom of the box in which he was confined in my office, it is probable that the sweet juice of the fruit is the chief attraction, and that fruit ordinarily would not be attacked by it unless its surface had been broken, permitting of the escape of its juices.

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### **Crioceris asparagi** (Linn.).

*The Asparagus Beetle.*

In the notice of this insect in the *First Report on the Insects of New York*, 1882 (pp. 239-246), it was stated, that in the State of New York "we only hear of its serious injuries from Long Island and the vicinity of New York city." It might have been added, that it was not known to occur elsewhere in the State.

Two years thereafter the insect appeared in Central New York. In June of that year (1884), Mr. E. S. Goff, at that time the Horticulturist of the Agricultural Station at Geneva, sent to me examples of larvæ, and the eggs on the leaves and slender branches of the plants, with the statement that it was the first time that he had met with the insect, but that he had learned that it was quite prevalent in and about Geneva. In a communication to the *Geneva Courier* of June 4, 1844, Mr. A. P. Rose wrote, after calling attention to the new insect pest: "I think that this must be the first year of its appearance in this part of the State. My attention was called to the subject by the late report of Professor Lintner, the State Entomologist, and on examining my own asparagus bed, I found a number of the beetles and great quantities of the eggs. As yet, no damage seems to have been done by them, but when the present crop of eggs hatches we may expect to hear many accounts of their ravages."

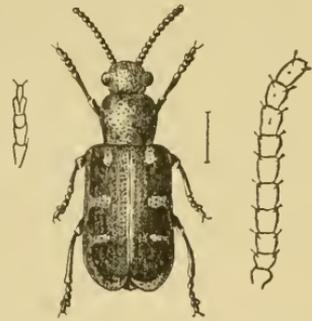


FIG. 20.—Asparagus beetle (a common six-spotted form), enlarged about six diameters, with further enlargement of antenna and front tarsus.

During the year (1892), the insect has made its appearance much farther westward in the State — at and about Rochester. At the meeting of the Association of Economic Entomologists in August, in that city, examples of the beetle taken within the city were brought in for identification. Later in the month, I learned through Mr. George S. Conover, an eminent horticulturist of Geneva, that Mr. John Charlton, florist and nurseryman of Rochester, had informed him that the insect was very destructive to his asparagus beds. Mr. Charlton had used every means that he knew of, and had sprayed with different insecticides, including Paris green, but had not succeeded in relieving himself from the pest, which was still abundant with him.

### **Systema frontalis (Fabr.)**

#### *Injuring Gooseberry Foliage.*

This little Chrysomelid beetle was quite injurious to the foliage of gooseberry bushes at the Geneva Agricultural Experiment Station, during the later part of July and early August. It had not been noticed there before. Upon the identification of the insect, received August 6th, request was made for additional examples for the State collection, but answer was returned, August 12th, that no more could be found, the bushes having meantime been sprayed with Paris green.

*S. frontalis*, although common, has not as yet attained as bad a reputation as has some of its congeners, as for example *S. blanda* Mels.,\* which has gone on record as injurious to cotton, to potatoes, and particularly so to corn (see *First Report on the Insects of New York*, pp. 155, 156), and to beets (*Insect Life*, iii, p. 149). *S. taniata* (Say) has been injurious to beans in New Mexico (*Insect Life*, iii, p. 122) and feeds on many of the *Cucurbitaceæ*, and has been taken in association with a number of grass insects (*id.*, iv, 198). *S. elongata* (Fabr.) is at times destructive to cantaloupes in Maryland.

### Chauliognathus Pennsylvanicus (De Geer).

#### The Pennsylvania Soldier-Beetle.

Mr. C. R. Moore, of Bird's Nest, Va., has sent this beetle — one of the *Lampyridæ* — as appearing with the rose-bug in the latter part of May, and eating roses and blossoms of grapes. He was informed that the insect was not recognized as an injurious one, although it was known to feed on the pollen of various blossoms. Writing again, he stated that he had observed the operations of the beetle on his grapes for the past three years, and wherever he had seen them operating, the blossoms were all destroyed.

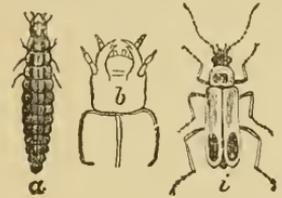


FIG. 21.—The Pennsylvania soldier beetle, CHAULIOGNATHUS PENNSYLVANICUS: a, the larva; b, its head enlarged; i, the beetle.

Should this form of injury by the beetle be established, it might be of more economic importance than the service rendered by it in its earlier stage of larva, when it is occasionally, at least, beneficial, in ferreting out and destroying the apple-worm of the codling-moth and the larva of the plum curculio and, as later discovered (*Insect Life*, i, p. 216), feeding upon the pupæ of the destructive cotton-worm.

### Pissodes strobi Peck.

#### The White-pine Weevil.

An attack on the Norway spruce, of what was in all probability this insect, was reported, in August, 1892, by W. C. Pierce, of Richford, N. Y.

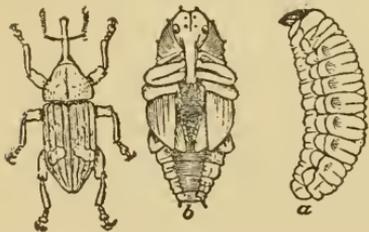


FIG. 22.—The white-pine weevil, PISSEDES STROBI: larva, pupa, and imago—enlarged.

According to his statement, one hundred and fifty Norway spruces, which had been planted in the cemetery at that place, commenced, last year, to die at the top. On examination, small borers were found working between the bark and the wood from above downward, and into the wood, beginning in the top shoot, and destroying the life of the tree as far as they progressed.

\* Recently referred, together with *ligata* Lec., *mitis* Lec., *ochracea* Lec., and others, to *S. taniata* (Say). See Dr. Horn's Synopsis of the Halticini of Boreal America, in *Transactions of the American Entomological Society*, xvi, 1899, page 273.

It is the well-known habit of this cureulionid beetle to deposit its eggs in the bark of the topmost shoot of young pines, and also in spruces, the larvæ from which burrow into the wood and thence to the pith, causing the tip to die, and thereby arresting the normal growth of the tree, and producing deformity, in the crookedness produced by the sending out of lateral branches.

Dr. Fitch has treated of this insect in his usual able manner in his Fourth Report, giving the natural history of the insect, and the serious injuries that it causes to the white pine — one of our most valuable timber trees. Dr. Packard has devoted a half-dozen pages to this insect in the recently issued (1890) Fifth Report of the U. S. Entomological Commission — on *Insects Injurious to Forest and Shade Trees*, in which he includes Dr. Fitch's account, with figures of the insect in its several stages, and its work in the deformities caused by it in white pines. In addition to the pine, *Pissodes strobi* also attacks spruces and hemlocks, nor does it confine its operations to the terminal shoot, but according to Dr. Packard, may "lay its eggs in the bark and mine the sap-wood of large pines and other coniferous trees."

Perhaps the best remedy for this attack is to cut off and burn the infested shoots before the beetles have emerged — during the months of July and August.

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### Myzus cerasi (Fabr.).

#### *The Cherry-tree Aphis.*

Notice of a severe attack of this insect was received from Mrs. E. C. Brinkerhoff, of Nunda, Livingston Co., N. Y., under date of June 4th, 1892:

We have a large cherry tree of over one foot in diameter. Some six years ago a very few of the cherries ripened that were very fine ox-hearts, but soon the remainder of the fruit was destroyed by a small, black insect similar to the small, black ant, but with wings. The insects almost entirely covered the cherries and the leaves and all were destroyed, but the tree leafed out again and has done so every year since. This year the pest came earlier and not a cherry was half-grown before they were destroyed. I have sprayed the tree twice each year for the past three years with Paris green, but it has done no good. I have two young sour cherry trees about forty feet from it that are not affected by the insect, nor plums, nor currants, nor do I know of any other neighbors who are troubled with it. Can you tell me what I can do to destroy them?

The lady was advised that Paris green was entirely ineffective against this or other aphides, but that remedies were found in kerosene emulsion, tobacco water, or strong soap suds, as given in the *Fifth Report*

on the *Insects of New York*, 1889, pp. 256, 257. It was important that these applications should be made as early in the season as the first aphides were seen upon the leaves, and before they are partly sheltered from the spraying liquid within the curls or folds of the leaves resulting from their attack.

The preference shown by this aphid for the ox-heart cherry is interesting. Dr. Fitch has stated that it never invades any of our native or wild cherry trees. It was for a long time believed that it was limited to the cultivated garden cherry, but within late years it has also been observed feeding on the plum by Dr. Thomas, in Illinois, in 1878; and in the *Country Gentleman* for May 26th, 1892, I have identified the species in specimens taken from the wild-goose plum in Central Kentucky. It has also been found in Europe on the black currant.

The life-history of this common and destructive species was fully worked out by Professor C. M. Weed, while connected with the Ohio Agricultural Experiment Station, and was published in the *Bulletin of the Station, Technical Series, i, No. 2, May, 1890*. By the kindness of the Director of the Station, the plate illustrating the several stages of the insect which accompanied Professor Weed's article, is herewith given.

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### *Pemphigus tessellata* (Fitch).

#### *The Alder-blight Aphid.*

This alder aphid has been unusually abundant the present year (1892) in various localities in the State of New York. Mr. John D. Lyons, of Monticello, N. Y., has written me that during the month of August it occurred in such numbers on the swamp alders that "it was hanging in strings from the branches."

A larger number of their white patches and of larger size than usual, were observed at Keene Valley, N. Y., during July and August. On removing a colony of the aphids from a branch of alder, on July 23d, thirteen of the eggs of *Feniseca Tarquinus* were found scattered singly, or in twos and threes on the bark beneath. For the manner in which these eggs are placed among the aphides,—for the interesting habits of the caterpillar while living among and subsisting on the aphides, and for a detailed account of the insect, the second volume of "Scudder's Butterflies of the Eastern United States," pp. 1016-1026, may be consulted.

Professor Comstock, in writing of *P. tessellata*, has stated:\* "There is a curious fungus which grows in large spongy masses immediately

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\* *Introduction to Entomology, part 1, 1888, p. 166.*



1a

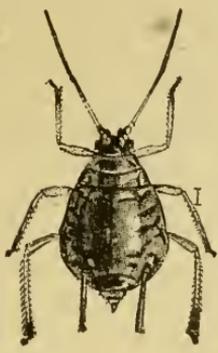


Fig. 1.

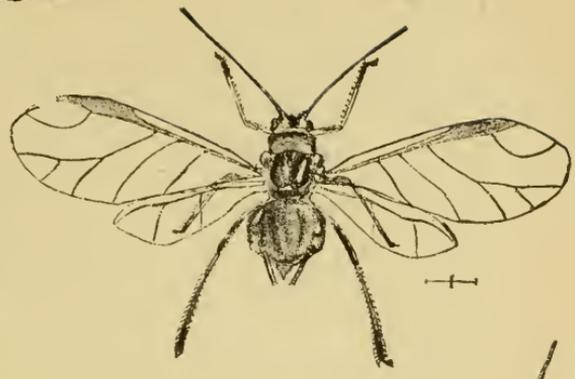


Fig. 2.

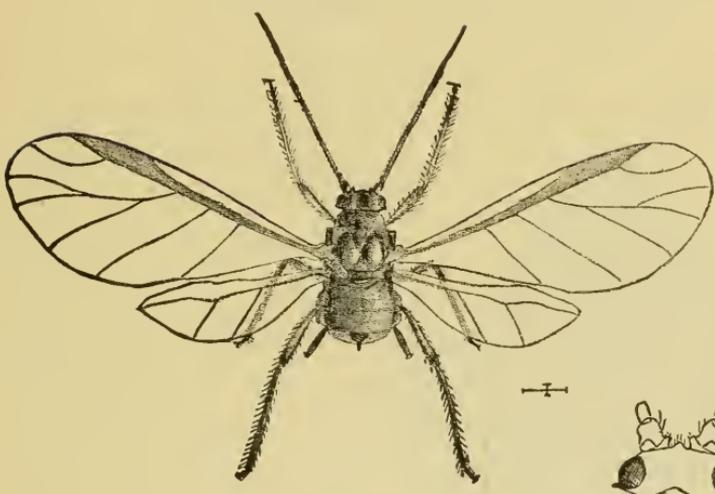


Fig. 4.

4a



Fig. 5.

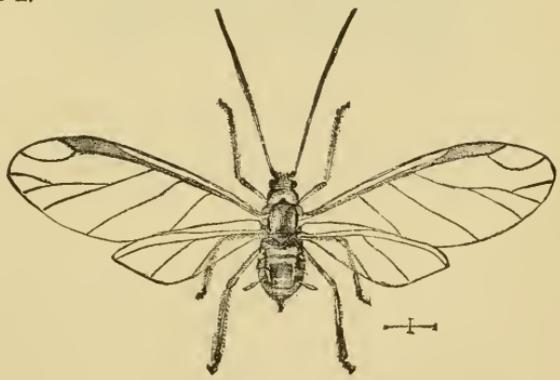


Fig. 3.

PLATE 1. The Cherry-tree aphid, MYZUS CERASI: Fig. 1, apterous viviparous, female; 1 a, head and antenna of same; 2, winged migrant; 3, return migrant; 4, winged male; 4 a, head and antenna of same; 5, oviparous female.



beneath the cluster of plant-lice; this is known to botanists as *Scorius spongiosum*. It is evidently fed by the honey-dew that falls upon it."

An example of this fungus has been shown me by Miss Florence Himes, of Albany, who had taken it from an alder in Washington park. The fungus was at the tip of a small twig that was given off from about four inches below the aphid-bearing stem, and curved upward so near it that it might easily have received quite an amount of the honey-dew dropping from the plant-lice. The specimen was identified by Prof. Charles A. Peck, State Botanist, as the above-named species of fungus. Two or three other examples of the same had been seen by Miss Himes.

### *Phylloxera vitifoliæ* (Fitch).

#### *The Grapevine Phylloxera.*

Leaves of grapevine having their under surface almost entirely covered with the galls of this insect, similar to the representation in Figure 28, were received August 6th, from Director Collier, of the New York State Agricultural Experiment Station. They were from the vineyards of Mr. Edwin Slocombe, of Camillus, N. Y., who reported the foliage of his Delaware grapes as being literally covered with the galls, as shown in the examples sent. The insects emerged a few days after the reception of the leaves.

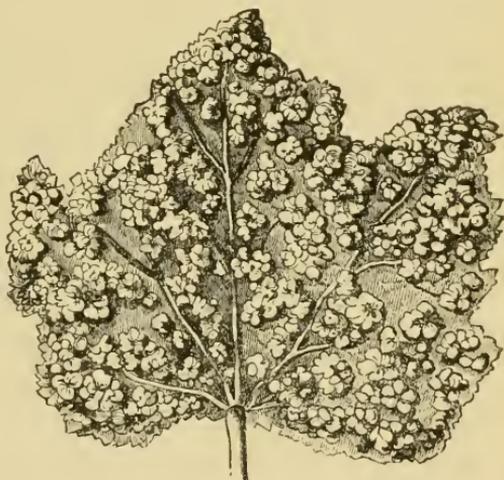


FIG. 28.—Grapevine leaf with galls of *PHYLLOXERA VITIFOLLE*.

Dr. Collier states that the insect has been quite plentiful on the Clinton grape, in the vineyards at the Station, and had also appeared on a few other varieties.

### *Crangonyx mucronatus* Forbes.

#### *A Blind Shrimp in Wells.*

Several examples of this crustacean were received from Oswego, N. Y., where they were taken from the water of a driven well of moderate depth, located in a gravelly soil, on a rising knoll. The creatures are slender forms, white, about a half-inch in length, with

rather long legs, and other thread-like terminal organs. "They are not occurring abundantly at the present time, but usually in the autumn small ones of the same general appearance are quite numerous."

The gentleman sending them desired to know what they were, and their source, as he feared that they might render the water unfit for domestic use.

It proves to be an interesting species of fresh-water shrimp which occurs only in such unusual localities as wells and subterranean streams. Like the blind craw-fish of the Mammoth Cave of Kentucky, to which it is closely allied, it is entirely destitute of eyes. It was first discovered by Professor S. A. Forbes, State Entomologist of Illinois, in a well at Normal, Ill., and was named and described by him, in *Bulletin No. 1 of the Illinois Museum of Natural History*, December, 1876, page 21. It belongs to the Order of *Amphipoda* and to the Family of *Gammaridae*. It is described as follows,—combining the generic characters with the specific:

*C. mucronatus* Forbes. No eyes [a congeneric species, *gracilis*, has eyes]. Peduncles of the two pairs of antennæ subequal. Hind angles of first three abdominal segments rounded; no clusters of spines on posterior abdominal segments. Last pair of abdominal legs with inner branch minute, outer branch shorter than peduncle; the first two pairs of feet subequal. Telson single, of male a slender spine about as long as first three abdominal segments.

Illustration is given of structure in seven enlarged figures.

Professor Forbes informs me that the above is the first instance in which this crustacean has been reported from east of Indiana. It is not confined to wells, but it has been frequently found in certain springs in seasons of high water when the soil is saturated; it also often comes to the surface at the mouth of drains, but as it is entirely subterranean, it does not live for any length of time in surface waters.

In explanation of its occurrence in drains, Professor Forbes has kindly written me: "The drains referred to in my letter are ordinary farm drains, but as the *Crangonyx* and its companion crustacean, *Asellus stygius*, do not occur in such drains indiscriminately, but only in here and there one, I presume that their appearance in such situations is due to the presence of springy ground and a penetration of the tiles by the subterranean crustaceans from some underground source."

The publication of the occurrence of the *Crangonyx* at Oswego, in the *Albany Evening Journal* of March 27th, 1891, and in the *New York Times*, brought to light other localities in the State of New York and elsewhere where it was also to be found. Referring to the *Times'*

notice, Mr. Walter L. Allerton, of New York city, wrote me as follows:

They are frequently found in wells in Westchester county and in Fairfield county, Connecticut, and are generally believed to indicate the purity of the water. I have a well at my residence at Mt. Vernon [Westchester Co., N. Y.] in which they are quite abundant. This well is about fifteen feet deep, and is supplied by a large stream flowing through a bed of coarse gravel resting upon rock. I have also known them to be pumped from a well in my father-in-law's place at Berwick, Maine. I have no doubt that if there was any object to induce a careful search they would be found wherever the same conditions exist, viz., an underground stream of good size flowing through a layer or bed of gravel.

The Asellus crustacean above named as often associated with the Crangonyx, is probably the one noticed in *Insect Life*, ii, p. 375, as brought up abundantly by a pump from a well in Keokuk, Iowa, and which is figured in the *American Entomologist*, iii, 1880, p. 36, and of which Mr. H. G. Hubbard, writing of the inhabitants of the little pools of water in the Mammoth Cave of Kentucky, states: "Though none of the pools were larger than an ordinary washbowl, I found them all veritable little aquaria, well-stocked with the crustacean described by Packard (*Cavidiotca stygia*). Some of the pools contained twenty or thirty specimens in all stages of growth."

The presence of these crustaceans in wells need not excite the slightest fear. All of their kind are eagerly sought for food, and are regarded by epicures as great delicacies. In their subterraneous habitat the waters are necessarily, from filtration, very pure, and when, through underground currents, they are carried into wells they attest to the purity of the incoming water. As inhabitants of wells, they would serve as purifiers in the capacity of scavengers, feeding upon any injurious matter that might be present.

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[From the Albany Evening Journal of February 14th, 1891.]

### Insectivorous Birds for Protection.

State Entomologist J. A. Lintner made a vigorous protest before the committee of the Assembly having under consideration the codification of the Fish and Game Laws, against the provisions in the proposed act which gave no proper protection to insectivorous birds. The law under consideration repeals all former laws upon the subject. In his address to the committee he urged the importance of protecting all such birds as are of benefit to the agricultural interests of the State.

Doctor Lintner said, that to the wanton destruction of our wild birds was largely owing the present excessive ravages of insect pests,

greater in this country than anywhere else in the world, and rapidly increasing annually. It had become a necessity that every bird which was of benefit to the agriculturist should be given protection. It was possible to pronounce definitely upon what particular birds were beneficial,—which were of negative importance, and which were injurious. This was arrived at through the investigations of the stomachs of birds shot during every season of the year, showing the food upon which each species feeds. These investigations were mainly conducted by the Division of Ornithology and Mammalogy at Washington, and when, as the result of such examinations, perhaps of a thousand stomachs of a single species, it was definitely asserted that such a bird was beneficial, the decision should be unhesitatingly accepted without question. The bird itself had borne testimony to the nature of the food upon which it fed.

Dr. Lintner asked of the committee to strike out from the printed bill under consideration, the following provision: "Nor does it [this act] protect the English sparrow, crane, crow, raven, hawk, shrike, owl, crow-blackbird or king-fisher;" also, the section, providing that the robin, blackbirds, and meadow lark may be killed during the months of November and December.

Referring to the birds named in the act, the professor said: The provision exempting the English sparrow lacked the stringent legislation against it contained in the old law. This bird was accepted as an unmitigated and intolerable nuisance, the rapid multiplication of which must be checked, even if poison must be used against it, as is being largely done in Australia.

The crane never occurs in the State of New York; the larger herons are mistaken for it. The precise economic status of the crow and the raven, were not yet determined; their investigation was still going on. It was certain that the crow rendered very valuable service in its feeding upon the white grub—a notorious pest,—often pulling up young corn to reach the grub concealed in the hill.

The hawks and owls, as a class, deserve protection more than any other birds, for the reason that considerably more than 90 per cent of their food consists of the enemies of the farmer, viz., field mice and grasshoppers. Even the bulk of the food of one or two hen-hawks—the red-tailed and the red-shouldered—consists of injurious rodents, and their occasional attack on poultry may properly be ignored.

The northern-shrike, notwithstanding its unpleasant popular name of "butcher-bird," had of late years, during its winter sojourn among us, treated itself almost entirely to the English sparrow, killing and impal-

ing on thorns or thrusting in forks of limbs many more of the birds than it consumed in food. It should by all means be protected as a valuable ally of the farmer.

The blackbirds, of which there are several species, should also be protected. When the crow-blackbird was seen tearing off the husks from the ears of corn to feed, as generally supposed, upon the corn, examination of its stomach showed numbers of a caterpillar which feeds upon the tips of the ears, and only incidentally a few kernels of the corn. The kingfisher is only injurious in fish-ponds.

The robin is one of our most valuable insectivorous birds, and should therefore never be shot. It may be pardoned for the berries and the cherries that it takes, in consideration of the hundredfold return that it makes. The meadow lark feeds only on insects and wild seeds. It is difficult to imagine how one could kill for sale as food so useful a bird, the musical notes of which, while lacking the compass and volume of the famed English meadow lark, quite supasses it in sweetness.

In place of the provisions of the act, which Dr. Lintner wished to be stricken from the bill, he asked to have inserted the following: "The English sparrow (*Passer domesticus*) is not protected under this act, and it shall be considered a misdemeanor intentionally to give it shelter or food, except with a view to its ultimate destruction; nor does it protect the crow, raven, or Cooper's hawk (*Accipiter Cooperi*), or the great horned owl (*Bubo Virginianus*)."

## INSECT ATTACKS.

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### Resistance of Fleas to Insecticides.

That fleas are capable of resisting the effects of insecticides such as will usually destroy insect life, is shown in the following communication received from a gentleman in Central New York, under date of August 14th:

DEAR SIR.—I am in a quandary, and feel constrained to appeal to you to help me out of my difficulty. About six or eight weeks ago I discovered that my cellar was infested with fleas, and I at once went at them with a mixture of turpentine and gasoline, and supposed I had exterminated the pests. About two weeks later I found they were still jumping about, and I treated the floors with a solution of two ounces cyanide potassium in one gallon water. Later, I used Persian insect powder freely and an infusion of *Cocculus indicus* berries, one gallon containing four ounces cyanide potassium. Then I again used the insect powder, and gave my cellar two sulphur fumigations, using three drams sulphur each time. I supposed I had really knocked them out, until this morning, when I found that there were still a few left to tell what they know about "hades." I have reached the limit of my knowledge of insecticides applicable to fleas, and, if you can suggest to me anything that I can use to rid my cellar of these rascals, I shall be exceedingly indebted to you. My house is a new one, with a well-lighted, airy cellar, and the fleas must have come from a Scotch Collie dog that has slept in the cellar. I have almost concluded that fleas will resist the action of any insecticide, for I noticed to-day a number of lively fellows in a barrel standing outside of my cellar, that had come up through sawdust that had been saturated with the fish-berry and cyanide potassium mixture that I had swept up from the cellar floors a couple of weeks ago. I am very anxious to rid my cellar of these pests before my family returns from the country, and an early response from you will be greatly appreciated. I remain, sir, &c.

Reply was made of inability to recommend better insecticides than those that had already been employed, unless, without endangering the lives or health of his family, the infested cellar be charged with hydrocyanic acid gas [made by treating cyanide of potassium with sulphuric acid]. It was probable that the larvæ had been killed by the insecticides used, and that the imagoes that were now appearing, in smaller numbers than before, were those which had been sheltered and protected by pupation.

A resort to the favorite means for the reduction of this pest, used many years ago in Poland—"the paradise of fleas,"—was recommended for use in the present stage of the infestation, viz., setting a shallow vessel of water (a film of kerosene might be floated on its surface) on the floor, with a lighted candle standing in it. The fleas, attracted to the light, would leap toward it, and be caught in the water and killed. In Poland they would often almost blacken the water with their bodies.

### White Grubs Injuring Nursery Stock.

A firm of nurserymen and florists at Newark, N. Y., have suffered severely from injuries from white grubs, as appears in the following letter, sent under date of June 18th, 1892:

"We have been corresponding with Dr. Peter Collier, of the Experiment Station at Geneva, N. Y., in regard to corn grubs. He has suggested that you might be interested to know about them, and might be able to recommend something that would help us to get rid of them. Two years ago these grubs destroyed thousands of dollars worth of nursery stock for us; last year they did not trouble us much; this year there appears to be millions of them, apparently about one year old. We do not suppose they will do as much damage this season as they will if let alone till another year, but, we wish, if possible to find some way of destroying them. Any suggestions that will help us in this matter will be thoroughly appreciated by us."

Request was made for some of the grubs to see if they could be identified. Upon their receipt, the following answer was returned:

"The larvæ kindly sent me on the 23d inst., are young white-grubs, apparently in the second year of their growth. Whether they are those of the May-beetle, *Lachnosterna fusca*, or even of the genus of *Lachnosterna*, I am unable to say, as we can not identify with certainty, especially when young, any of the many different species of that genus, of which nearly one hundred have been described in their beetle stage [see remarks in 8th Rept. Insects of N. Y., page 175].

"White grubs of *Allorhina nitida*, in experiments made in the Capitol grounds at Washington, were killed by applying freely to the ground, kerosene emulsion of the dilution of one part to eighteen of water (see *Insect Life*, i, 1889, pages 48, 49), and afterward carrying it into the soil by soaking it with water for several days in succession. The grubs were among the grass roots at the depth of from two to four inches when the emulsion was first applied, but were subsequently found dead at various depths down to sixteen inches. The experiment was very satisfactory.

"If this method could be made equally effective with you, it would certainly pay to resort to it. The expense of following the emulsion with repeated water application could, I suppose, be saved, if the kerosening should be done before a rainy spell.

"At what depth do you find the grubs at the present time, and what nursery stock do they mostly infest?"

"I wish that you would try the emulsion upon an area of some extent, and, after the rains, dig for the grubs, and see what the effect has been. The low cost of kerosene would permit of its free use if found to be effective. You probably have the formula for the preparation of the emulsion — if not I will send it to you."

In reply to the question of the nursery stock attacked, answer was made: "We raise mostly roses, ornamental shrubs, and grapevines. These grubs attack all of our stock; we even find them at the roots of two-year-old apple, peach, and plum trees, but they do the most damage to the roses. We would like to try the kerosene emulsion, and, if you will kindly send us the formula, we will do so, but fear that it may kill the young rose-bushes as well as the grubs."

The formula for the emulsion was sent as requested, but no report of results from its use has been received.

As the Entomological collection of the U. S. National Museum at Washington, D. C., contains more larval Coleoptera than any other collection in the United States, examples of the grubs noticed above were sent by me to Dr. Riley, at Washington, in the hope that they could, by comparison, be at least generically determined, but unfortunately, by some mishap, they failed to reach their destination.

The enormous aggregate of losses in garden and field crops inflicted by white grubs is offered as a reason for appending to the above some additional words in relation to this destructive class, which will be found of economic importance in directions that will be pointed out.

Professor Forbes, State Entomologist of Illinois, has recently written:\* "The white grubs are among the immemorial enemies of agriculture in both worlds, but in neither Europe or America has the problem presented by their injuries on the farm and in the fruit and vegetable garden received a satisfactory solution."

While still unable to recommend entirely effective, simple, and inexpensive methods for destroying these larvæ when infesting grass land or other large pieces of ground, we now know through the labors of Professor Forbes† so much of the life-history of the more common species allied to the May-bug, *Lachnosterna fusca*, that we may say,

\* *Seventeenth Report on the Insects of Illinois*, 1891, p. 30.

† On the Common White Grubs, *loc. cit.*, pp. 30-53, plate iv, figs. 1-7.

with certainty, when fields infested with these larvæ may or may not be with safety planted to another crop.

For many years past we have been told that the grub of the May or June beetle required three years for its maturity. The most particular statement of its transformations was that given by Professor Riley in his *1st Report on the Insects of Missouri*, in 1869. According to this, the eggs were laid in the ground after the pairing of the beetles, and hatched in the course of a month. The grubs attained their full size in the early spring of the third year, when they changed to pupæ, and soon thereafter to beetles, emerging from the ground in May. "Under favorable conditions it is probable that some of the grubs became pupæ and even beetles in the autumn, subsequent to their second spring," but remained in the earth until the following spring.

In correction of the above, Professor Forbes has given as the result of his studies upon the white grubs in Illinois (where thirty-one species are known to occur), and more particularly upon six of the most abundant and most destructive species, viz., *Lachnosterna gibbosa*, *L. inversa*, *L. fusca*, *L. rugosa*, *L. implicita*, and *L. hirticula*—the following as their life-history, quoting his carefully considered words:

"It is not too much to say concerning the six species above, and quite possibly of all the others, that they lay their eggs in June and early July; that these eggs hatch in from ten days to two weeks; and that the grubs live in the earth for a number of years unknown, but seemingly at least for two; that they may begin to pupate as early as the middle of June [late spring, but pupæ may be found until September 5th] of the year when they become full grown, and may form the first imago in the earth by the middle of August and the last as late as the middle of September [all in summer], but that they very rarely, if ever, pass the winter in the pupa state. They form the adult in this latitude in late summer and early fall, and escape from the earth the following spring and early summer \* \* \* in April, May or June, or rarely in July."

Presuming, as it seems we may do, that there is a year in which the *Lachnosternas* deposit their eggs,—identical with the years in which the beetles appear, and that these are separated by a term of years (probably three), instead of there being deposits of eggs in successive years, giving grubs of various sizes and ages in the same field,—we may educe from the above statement of life-history the following:

1. The age of grubs turned up in spring plowing, seemingly about *half-grown*, can not positively be told; it is, therefore, uncertain whether they are to cease from feeding the following spring so as to

exempt from injury by them grain sown in the autumn and crops put in the following spring.

2. If *full-grown* grubs (their size is well known to almost every agriculturist) are found in the spring, no injury to roots will be caused by them after midsummer—during autumn or the following spring,—leaving winter wheat, and corn, potatoes, etc., of the succeeding year free from their attack.

It is interesting to compare the above life-history of *Lachnosterna* worked out in Illinois by Professor Forbes with that published in the *Patent Office Report* for the year 1852, part ii, page 219, by Mr. D. L. Bernard, of Ulster county, New York, which I have quoted in my pamphlet entitled "The White Grub of the May Beetle," being *Bulletin No. 5 of the New York State Museum of Natural History*. These almost precise points of agreement may be noticed: Eggs deposited generally in the month of June (Bernard); in June and early July (Forbes). Life duration of grubs, two years (B.); seemingly two (F.). larvæ mature, middle of June (B.); the same (F.). Pupation, middle of August (B.);\* begins middle of June and continues into September (F.). The perfect stage or beetle, about the last of September (B.); middle of August to middle of September (F.). The beetle appears abroad about the last of April or first of May (B.); April—June (F.).

It will be observed that the above life-histories shorten the grub stage by one year from that given by most of our authors and drawn mainly from that of the European cockchafer.

See, also, "Notes on *Lachnosterna*," by G. H. Perkins, in *Insect Life*, iv, pp. 389-392.

### The White Grub Eaten by the Robin.

Mr. W. C. Little, of the Commercial Nurseries, at Rochester, N. Y., has sent me the following note of observations made by him, of the fondness of the robin for the white grub of our lawns and fields, *Lachnosterna fusca*:

I do not remember to have seen it stated in print that the robin is a great feeder on the white grub of the May Beetle. Two or three years ago I noticed the robins industriously engaged in grubbing on our lawns. I thought at first that they were after the earth worms, but their mode of procedure was so peculiar that I was led to investigate and interrupt their operations; and in every instance I found the large white grub at the bottom of the hole which the bird had drilled with its beak—about an inch and a half below the surface. I estimated

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\* It will be observed that this date is later than that given by Prof. Forbes. They agree as to time that feeding ceases, but Mr. Bernard says that they then "descend deeper in the earth and become torpid until about the middle of August."

that these robins must have destroyed hundreds of grubs on my premises that summer.

In "Bulletin No. 5 of the N. Y. State Museum of Natural History," the robin was merely named among a few other birds that were said to feed on white grubs, in the absence of any definite information of the extent to which they entered into its food. That in addition to its other well-known insectivorous habits, it is also an active white grub destroyer, should certainly increase our regard for it, and secure as far as possible its protection.

### A Maple-Tree Pruner, *Elaphidion parallelum*.

The following communication and reply is from the *Country Gentleman* of September 9th, 1886 :

"I enclose a sample of fallen limbs taken from beneath the ornamental maples that help to beautify the grounds surrounding the country residence of Hon. J. B. Dutcher, Pawling, Dutchess Co., N. Y. These pieces represent portions of boughs that have been cut off by a worm, and have fallen to the ground.

"So extensive is the injury inflicted by these insects that the handsome tree tops are becoming sadly disfigured by the unequal dismemberment of twigs and limbs that daily drop out, even if nothing worse results from it. The section of wood illustrates the manner in which the damage by these pests is effected. A knife has been passed longitudinally through one of the pieces to expose the interior of the wood. It will be seen that the heart or pith throughout the entire length of the piece has been destroyed. You will also please observe that the end of one of the sticks is a cross-cut, made by the worm, the woody part being neatly severed, while the outer covering or bark was left intact. It is a peculiar feature characterizing the work of this worm that it first enters the wood at the junction of a twig or limb with its larger parent stem. Having reached the heart, it turns and follows this until satisfied with the length of the tube bored out, and is then ready to cut the limb off. The reason for selecting a knotty point wherewith to commence business is known only to the instinct which prompts it to injure the tree at all. The work of cutting off the limb is done from its resting place in the heart of the wood, the cut thus radiating outwardly in continually enlarging circles until all is detached excepting the bark. There is, apparently, no aversion to attacking at any point other than a knot at this stage of the work,—the clear wood of the inclosed specimens being squarely cut off at an intermediate point between a growth of knots.

"Nature seldom commits the error of an absolute waste of energy, so it may be assumed that this operator has a mission of some sort, and means

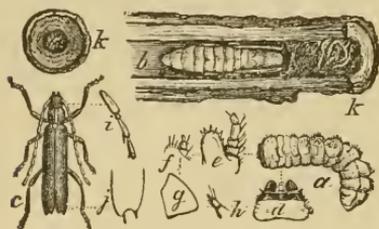


FIG. 29 — ELAPHIDION PARALLELUM: a, larva; b, pupa, in burrow; c, the beetle; d, e, f, g, h, head and mouth parts of larva; i, basal joints of antenna of beetle; j, tip of wing-cover; k, section of cut-off twig. (From Riley.)

business. A little study into the possible object this fellow may have in tree chopping, I fancy reveals an effort on his part simply to reach the ground without exposure, and the boring and cutting is merely a means to an end. The two specimens of worms which accompany the pieces of wood, I hope may reach you lively enough to afford an examination. It is evident that while abundantly able to act on the aggressive, they have no means of

defense, and are doubtless toothsome morsels to any prying woodpecker. Their length is one-fourth to three-eighths of an inch, and their body and the absence of any rapid means of locomotion would render them an easy prey, but for instinct of secrecy during the process of severing a limb. The wood is cut squarely in two, but the outside bark is left untouched as previously stated, so that while a wandering woodpecker may go about seeking a sign, no sign can be found.

"The mission previously referred to, probably includes a scheme of life, covering transformations from one form and habitation to another, until finally emerging into that of a fly or winged moth, which I imagine is the immediate ancestor of this fellow.

"After the wood is cut, securely hidden in the portion of the limb beyond the cross-cut, he has only to wait a passing breeze to have the branch blown off and borne to the ground. Once arrived there safely, he can quit the bough at the first favorable chance and pass into the ground.

"How much damage they may eventually cause to maples can only be conjectured. Nothing similar to this pest has hitherto been noticed in the vicinity of Pawling, and any suggestion through your columns looking to a remedy or preventive will be very thankfully received."

To the above the following reply was made to my correspondent, Mr. A. T. Thomas, of New York city :

The samples of wood sent, the larva (crushed and useless for specific identification), and the account of its operations given, show the cutting off of the limbs to be the work of a longicorn beetle of the genus *Elaphidion*, and of the species *villosum* (Fabr.) or *parallelum* (Newm.). The former, originally described in this country as *Steno-*

*corus putator*, the oak-pruner, by Prof. Peck, in the *Massachusetts Agricultural Repository and Journal*, vol. v, 1819, is the species that so frequently comes under observation as the pruner of the red and black oaks — occasionally of the scarlet oak. It also, according to Dr. Fitch, occurs in the beech, birch, chestnut, apple, and peach; in the spruce, on the authority of Dr. Haldeman, and in the hickory, according to many writers and my own observations. *E. parallelum* has been bred from some of the above food-plants, and also from plum; in the latter, not as a pruner, it is stated (*American Entomologist*, i, p. 187); also from apple (*id.*, ii, p. 60). It also bores the branches of the orange, according to Mr. Hubbard.

An Elaphidion attack upon maples is not of common occurrence. Dr. LeBaron, former State Entomologist of Illinois, mentions Elaphidion larvæ as well-known pruners of oaks, maples, and other trees (4th Report, p. 154), but I find no record of the particular species bred from the maple. They are not included among maple insects in Dr. Packard's "Insects Injurious to Forest and Shade Trees." The severe attack brought to our notice in the above communication, is, therefore, of considerable interest, and it is to be hoped that the additional twigs containing the larvæ which I have requested of the writer may be sent to me and will give me the beetles for identification some time during the winter or the coming spring. [They subsequently gave *E. parallelum*.]

The observation of Mr. Thomas of the entering of the larva at the junction of a twig or limb with its larger parent stem, may need some correction. The burrows will, it is true, be found passing from the twig into the branch, but Dr. Fitch is probably correct when he states that the beetle deposits her egg near the tip of a twig of the same year's growth in the angle where a leaf-stalk branches from it. The egg hatching, the young larva burrows into the center of the twig, and consumes all the soft pulpy tissue until only the bark remains, which in its thin and tender condition, withers and dries. By this time the larva has eaten downward in the center of the twig, through the pith, to its base, and onward into the main branch from which the twig grows, passing to the center, an inch or less below the twig. Here, when about half-grown, it proceeds to cut off the branch, in the manner stated in the above communication, and as more fully narrated by Dr. Fitch, of *Elaphidion villosum*.

The account given by Dr. Fitch is quite interesting, and will amply repay for its perusal. It is to be found in his *Fifth Report on the Insects of New York*, pp. 17-24, and also in the *Transactions of the New York State Agricultural Society* for 1858, vol. xvii, pp. 797-812, under

the name of the Oak-pruner, *Elaphidion putator*. In his Report 3, pl. 2, fig. 2, is a figure of the beetle. It is also noticed and figured in Dr. Harris' *Insects Injurious to Vegetation*, 1862, p. 98, figs. 47-8-9. Dr. Packard, in his *Guide to the Study of Insects*, 1869, on p. 496, represents the larva and pupa, but the accompanying figure should not be accepted for the imago. Excellent figures of *E. parallelum* in the larva and beetle, with enlargements of portions of the same, and of the pupa in a section of the excised branch, after Riley, may be found in Dr. LeBaron's *Fourth Report on the Insects of Illinois*. [These are given in Figure 29.]

In speculating upon the reason for the cutting off of the twigs by the larva, Dr. Fitch writes as follows: "As the worm is to remain in the limb through the winter, it appears to foresee that, from being wounded, as it is, it will perish and become too dry if it remains elevated in the air; it therefore drops it to the earth, where, lying among the fallen leaves and buried beneath the winter's snow, it remains moist and adapted for the development of the insect within it."

Although secreted within the central portion of the branch, the larva does not enjoy immunity from its foes. Woodpeckers may discover its retreat while still upon the tree, and artfully extract the favorite tid-bit. After the larvæ drop to the ground their burrows are probed, and they are extracted by many of the smaller birds, or eaten by burrowing insects. Certain it is that many of the excised twigs, when examined, will be found without the larva within them.

The branches sent by Mr. Thomas were received about the 20th of July, when the larvæ were already at least half-grown: the eggs had probably been deposited in early June. One of the twigs, four-tenths of an inch in diameter, had been cut off at three inches above where the burrow entered from the twig that nurtured the young larva. A section of a larger branch, over half an inch in diameter, shows the entrance of two larvæ from lateral twigs, one inch and three-fourths apart. In this the burrowing is still going on, as is shown by a large quantity of small, round, hard, whitish grains of excrement which are being thrown out. [Of several branches of red oak received from McGregor, Iowa,— in one, measuring one inch in diameter, the cutting was unusually thorough, passing entirely through the wood and into the bark, leaving only a thin outer film of the bark, so that the branch would break off by its own weight. Another section of a larger branch, measuring one inch and one-half, shows one-fourth of its plane uneaten, so that the action of the wind was necessary to its breaking and separation.]

Dr. Fitch, in writing of the transformations of the oak-pruner, states that some of the worms enter their pupa state the last of autumn, and others not till the following spring, to come forth as perfect beetles in June. Mr. F. Clarkson, of New York city, in a recent number of the *Canadian Entomologist* (1885, xvii, p. 188), states that this insect was very abundant in Columbia county, this State, in 1878, and that the September winds brought showers of twigs and branches to the ground, containing nearly full-grown larvæ, in tunnels of from ten to fifteen inches in length. Some of these, which had been placed in a room having very nearly the condition, thermometrically, of the temperature without, were opened in the early part of November, and were found in every instance to contain the beetle,—the transformation from the larva to the imago having been completed in less than eight weeks. It is not stated whether the season had been an unusually warm one, through which the ordinary development of the insect may have been hastened.

*Remedy.*—It is seldom that the operations of this insect amount to more than a moderate pruning of the infested trees, but, as in the instance above brought to our notice, they are seriously marring the beauty of the trees that they occupy, it is important that the attack should not be permitted to continue and extend itself. As the insect remains within the fallen branches until the following spring, and it is probable that very nearly all the tunneled branches fall to the ground, we have a simple and easy method of arresting the injuries. We have only to collect and burn the severed branches as soon as they fall, or at any time during the autumn, and the deposit of eggs for another brood the following season will be prevented. If danger is apprehended that the species may be continued through a few of the insects remaining upon the tree, watch should be kept for withering ends of branches during the summer and early autumn, which may be removed and destroyed, or the outer limbs may be beaten, after the burrowing operations have ceased, with a moderate force, which would serve to break off any partially excised branches which the winds had failed to remove.

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*Diabrotica vittata* (Fabr.).

*The Striped Cucumber Beetle.*

A squash plant, of a growth of nine inches above the ground and three inches of stalk beneath, was submitted, June 30th, for examination and for some method of destroying the insects attacking it.

Three of the larvæ of the cucumber beetle were boring into the stalk at about an inch downward upon it, and several round holes were

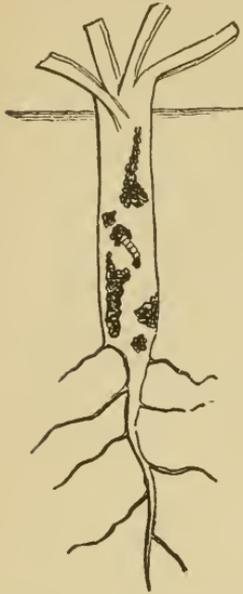


FIG. 30.—Cucumber root infested with the larvæ of the striped cucumber beetle. (After Fitch.)

seen that had been made by others — some of them clean cut and others surrounded with irregular erosions; still others were superficial and had not extended into the root. On cutting open the stalk seven nearly full-grown larvæ were taken from its interior, within a length of two inches, in longitudinal tunnels which they had excavated. Figure 30 shows the operations of the larvæ within a root, and Figure 31 the larva in natural size and enlarged.

The best method of protection from this form of attack would undoubtedly be in preventing the deposit of the eggs on the stalk of the plants by the parent beetle, by covering them during the early stage of growth with a thin loose muslin or netting. By the time that they have out-grown such a protection, they will have attained a sufficient size and vigor of growth to enable them to resist attack unless it be unusually severe. Possibly an

early application of the burdock infusion which is noticed in the *Fifth Report on the Insects of New York*, page 158, if repeated at intervals of about a week, would prevent attack by rendering the plants distasteful to the newly hatched larvæ. Kerosene emulsion — one-fifteenth kerosene,

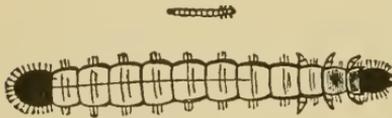


FIG. 31.—Larva of the striped cucumber beetle, *DIABROTICA VITTATA*, natural size and enlarged. (After Fitch.)

poured about the roots would destroy the eggs already deposited and such of the larvæ as had not already burrowed into the root beyond its reach.

In a communication recently made, by me to the *Country Gentleman* experiments by Professor Weed and others, with remedies and preventives for the beetle were noticed as follows:

A correspondent asks, what is the best remedy and how should it be applied for the destruction of the striped cucumber beetle?

This question is often asked, but can not be replied to satisfactorily. Various preventives are announced from time to time, as invariably giving efficient protection, but when tried by other persons, in different localities, only partial success is reported.

Last year a series of careful experiments were made by Prof. Weed, of the Ohio Agricultural Experiment Station in order to test the value

of the various preventive and remedial methods that have been proposed against the beetle, *Diabrotica vittata*. The methods experimented with were divided into these four classes: 1. The use of offensive odors; 2. Mechanical coating of the leaves; 3. Poisonous coating of the leaves; 4. Inclosing plants under tents or gauze-covered frames.

The results of the above, made when the beetles were exceedingly abundant, were as follows:

Of class one, five substances were tested, viz.: hen manure, cow manure, carbolic acid, and bisulphide of carbon. None of these proved practically successful.

Of class two, three substances were tried, viz.: coal soot, gypsum, and saltpetre. Of these, gypsum only showed some beneficial effect, while the other two were worthless.

Of class three, were pyrethrum, slug-shot and peroxide of silicates. Pyrethrum killed the beetles with which it came in contact, but soon lost its efficacy. Slug-shot injured the plants. Peroxide of silicates was beneficial, and saved such plants as had been well started.

Class four, or fencing out the insects, was by far the most satisfactory. It was best accomplished by covering the plants with a piece of cheesecloth about two feet square, held up by a bent hoop or wire, or two crossing at right angles, and fastened at the edges by loose earth or stones.

It would seem from the above that safety from the cucumber beetle is to be found only by excluding the insect from the plant. This method would, of course, be effectual if all attack from above and below ground could thus be prevented; but unfortunately it is not proof against the operations of the larva in the stalk, or the beetles that may develop from the ground beneath the plants.

It will be observed, however, that only a few substances were tested, and while these proved inefficient, it is not improbable that others, had they been tried, might have given better results. Paris green and London purple were not experimented with. Possibly they would not have been as injurious as slug-shot.

A writer in one of our journals (*Garden and Forest*, for March 12th, 1890), has stated that he annually saves his cucumber plants by sprinkling a handful of bone dust over each hill as soon as the seed-leaves appear, and rarely has to repeat the operation, unless washed off by rain.

A correspondent of the *Rural New-Yorker* claims as a cheap, simple, and effective preventive, spirits of turpentine mixed with common land plaster—about a tablespoonful of the turpentine to two or three gallons of plaster. “In the morning after the plants have shown up nicely,

a man goes through the patch, taking two rows at a time, and scatters a small pinch on each hill. The turpentine drives away the beetles, and we seldom make the second application."

Another writer finds safety from the beetle by planting cucumbers and beans in alternate hills. In order to get two crops from the same ground, it is marked in rows three feet apart each way, and planted with melons or cucumbers in hills alternately in one row, and in the next, all beans. The string beans are out of the way in time for the melons to occupy the ground.

Another person has tested the efficacy of beans for ten years, with perfect success, by planting a circle six inches apart around the outer edge of each hill. The beans would come up in advance, and no beetle would molest the cucumbers. (*Country Gentleman*, for November 20th, 1890.)

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### The Grape Curculio, *Craponius inæqualis* (Say).

A correspondent from Sanford, Tenn., sends grapes that have been stung by an insect, desiring to know what the insect is. The bunch from which the grapes were taken had every one punctured in the same manner. The damage to his crop from this cause was very great, and he could only secure a good crop by bagging the clusters. The grapes showed a small, dark brown spot or puncture on one side, surrounded with a rounded discolored blotch. On opening them, a yellowish-white footless larva with a pale-brown head was found working within the pulp, and having partly eaten one or more of the seeds, somewhat after the manner of the caterpillar of the grape-berry moth. It was recognized as the larva of the grape curculio, *Craponius inæqualis* (Say).

This insect is rather a local one, and is only occasionally reported as injurious to the grape crop, and rarely so, outside of the valley of the Mississippi river, although it ranges, according to LeConte and Horn, over the Middle, Southern, and Western States. It was found by Professor Webster particularly abundant on one of the Ozark mountains in Arkansas, working in both cultivated and wild grapes. I have never met with it in the State of New York, but it is probably occasionally found therein, as it is reported from opposite New York city, at West Hoboken. Its attack can, of course, be prevented by bagging the clusters, and as bagging not only improves the appearance of the grapes, but also preserves them from injury to which they are exposed

from several species of insects besides the curculio, and from some of the fungus attacks to which they are liable, it would be well always to resort to this method of protection wherever the curculio abounds. Where this is not done, perhaps the next best means of relief would be that of jarring the beetles from the vines upon a cloth when they visit the berries during the month of June for feeding on them and for depositing their eggs.

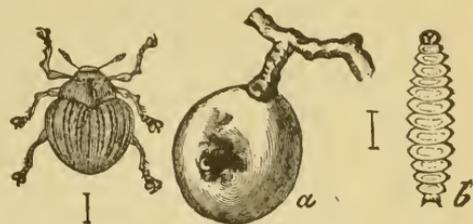


FIG. 32.—The grape curculio, *CRAPONIUS INÆQUALIS*: a, grape injured by the larva; b, the larva.

The beetle may be recognized by its black color sprinkled with grayish spots; its prothorax with four large tubercles of which the outer ones are acute; the alternate interspaces of the wing-covers the more elevated and somewhat uneven; and its rounded form, unlike the oval of most of the curculio tribe. Its length is rather more than one-tenth of an inch. It is represented in Figure 32.

In August, the larva having attained its growth, drops to the ground and enters it for pupation, where it remains for about a month before changing to the beetle. If during this time the ground beneath the vines could be worked, many of the delicate larvæ or pupæ would be crushed or injured to a degree sufficient to prevent their maturity. The arsenical spraying so effective against the plum curculio, would not be available, it is thought, for protection against this insect. See Walsh, First Annual Report on the Insects of Illinois, 1878, pp. 13-21, fig. 1. Riley, First Report Insects of Missouri, 1868, pp. 128, 129, figs. 70-72. Saunders, Insects Injurious to Fruit, 1889, pp. 300, 301, figs. 311, 312. Webster, in *Insect Life*, iii, 1891, pp. 452, 453.

### The Peach-bark Scolytus, *Phloeotribus liminaris* (Harris).

Mr. George C. Snow, of Penn Yan, N. Y., sent on the 7th of May, peach bark infested with the above-named insect, accompanied by the following note:

I send you by this mail under separate cover a section of peach bark which you will find filled with an insect that is new to me. It may be of interest to you to know that the trees that they are in are literally full of them from collar to branches.

I find an unusually large number of borers in the trees this spring. I am intending to make a mixture of sludge-oil soap, carbolic acid and lime for a tree-wash, to prevent any eggs from being deposited. Do you know of anything better?

*Answer.*—The insects sent in the bark are a destructive bark-borer, one of the *Scolytidæ*, known as *Phloeotribus liminaris*. Ordinarily it

does not attack perfectly healthy trees, and from the fact that it is often found in trees affected with the "yellows,"—years ago it was commonly but erroneously believed to be the cause of the "yellows."

As we are not acquainted with the entire life-history of this species, I hope that you will be able to tell me from your observations whether the beetles are at this time boring into the trees for oviposition or are emerging from them. From the red dust that I find sprinkled on the bark, I judge that they are entering, as the pear-tree *Scolytus*, *Xyleborus dispar*, is known to do about the middle of May. If the beetles are still resorting to the trees to commence their burrowing in, a thick wash of sludge-oil soap and carbolic acid should repel them. If very thoroughly applied, it might even reach and kill those that had already entered, if they have not penetrated too deeply.

I wish that you would try the experiment of applying with an atomizer to a single infested tree of not great value, undiluted kerosene, over the entire trunk, so as to have it enter the little holes that the beetles have made. I do not think that kerosene thus applied would kill or even injure the tree. I have atomized it freely over rose-bushes and small branches of plum trees, without harm resulting.

If this little beetle once takes possession of a tree—unless it should be found that it can be effectually killed by kerosene as above suggested—the fate of the tree is sealed and it can not long survive. It had better be cut down at once and burned, rather than it should remain as a breeding place for the multiplication of the pest.

The wash that you name will be excellent for excluding the peach-tree borer, and I do not know of a better one.

I have noticed the *P. liminaris* in my Western New York Horticultural Paper of last year—"Late Experiences with Insects,"—and in my Fourth Report—in each quite briefly.

ALBANY, *May 8th*, 1891.

From the small piece of bark received from Mr. Snow, there were found on June 15th in the box in which it had been placed, four dead and one living *P. liminaris* beetles, with living ones still in the bark.

To those who still entertain the belief that this beetle, in its attack of peach trees is the cause of the "yellows," the reply made by me, through the *Country Gentleman* of November 3d, 1887, page 837, to an inquiry from Ringwood, Ontario, Canada, may be of interest:

Inclosed I beg to hand you specimens of an insect taken from one of my peach trees. The inspectors for the yellows have recently been through this district, and on examination, have condemned several trees in my orchard and others. They say that the presence of this insect is a sure indication of the yellows; also an examination of the

now little remaining fruit they say also shows signs of the disease by the pinkish appearance of the flesh around the stone. The insect appears to bore into the bark at the butt of the tree, similar to the borer, but above ground, showing a small amount of sawdust around the hole. Would you kindly give me through the columns of your valuable paper your opinion? While being perfectly willing to destroy the trees if so advised, we are not quite so sure of the experience of our inspectors to justify us in destroying our orchards. E. F. O.

The insect sent, taken from peach trees, the presence of which, according to the statement above, fruit-tree inspectors of Ontario pronounce to be a sure indication of "yellows," is one of the *Scolytidæ*, or bark-boring beetles, known as *Phloeotribus liminaris* (Harris). Its presence in a tree by no means shows the existence of "peach yellows" therein. Many years ago, Miss Morris found the beetle under the bark of peach trees affected with the yellows, and hence supposed that it was directly connected with that malady (*Downing's Horticulturist*, iv, p. 502, and Harris' *Insects Injurious to Vegetation*, 1862, p. 88). Dr. Harris and Dr. Fitch each found it under the bark of elms, where it occurs so often that it has been written of by Saunders in his *Insects Injurious to Fruits*, and by other writers, as "the elm-bark beetle."\*

This beetle, like most of the other members of the *Scolytidæ* family, does not attack a peach or other tree for breeding therein (it may for feeding purposes) unless it be in an unhealthy or diseased condition. Injury from frost might invite its attack, or the presence of the peach-tree borer, *Sannina exitiosa*, in burrows about its base. According to Professor Penhallow, the operations of this last-named insect produce symptoms in the infested tree so like those of the yellows that they might easily be mistaken for it. The same writer, who has given earnest study to peach-tree yellows, states that the *Scolytidæ* can not in any way be connected with that disease, or even be considered as a predisposing cause.

I have, at different times, received the beetle under consideration, *Phloeotribus liminaris*, from peach-trees in localities where the yellows has not been known. Positive indications of this mysterious disease (its cause as yet not ascertained) must be found in other than insect presence.

The following have been named by authorities as reliable indications :

1. The production on the main stem and along the branches, of a multitudinous growth of slender, wiry, shoots, having small, narrow, yellowish-colored leaves.

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\*It has since been ascertained that it does not occur in the elm, but that another species, *Hylesinus opaculus*, had been mistaken for it.

2. The premature ripening of the fruit, which, when first attacked may be nearly normal in size, but becomes smaller each year, with its surface spotted more or less, and the flesh more deeply colored around the stone (*U. S. Dept. of Agriculture — Report of the Statistician, No. 43*).

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### An Unrecognized Attack on Pease.

Mr. B. W. Gregory, of Liberty, Sullivan Co., N. Y., reports in a letter of August 9th, 1892, the following injury to his pease:

Inclosed please find samples of peas: can you tell me what the matter is with them? They are not attacked by birds or by fowls, for I have watched them closely, nor have I been able to find any insect working on them. The vines are perfectly healthy and vigorous, and are of the Sexton's Alpha variety. The first picking from them was about June 25th, at which time four-fifths of them were affected like the sample. The later pickings were less injured. I picked from the same vines to-day and those sent [five pods] were all that I found. Other beds in the neighborhood are affected in the same way. You will observe that the lower end is cracked open, which is invariably the case when I find them, and the pulp is all taken out. Whatever insect does the work, I think does it at night.

In the pods sent, they had split open at the lower end, but the sides were closely adherent. From all of the pease within, the pulpy portion had been entirely removed, leaving only the outer wall, in more or less irregular shape.

In the absence of any knowledge of such an injury, which seemed, in all probability to be that of an insect, and as there was no possible clue to the depredator, the specimens, while still fresh, were taken to the meeting of the Association of Economic Entomologists at Rochester, and shown to those present. While all concurred in the belief that it was an insect attack, no one could assign it to any known insect.

Mr. Gregory was requested to keep careful watch another year and to report any discovery that he might make.

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### The Plum-tree Aphis and the Brown Rot.

Mr. J. W. Smith of Schoharie, N. Y., sends, June 5th, 1891, an aphis which is badly infesting his plum trees. Nearly all of them are winged, with a black head and thorax, a green abdomen, spotted with black, and yellowish legs. Plums are also sent, marked with a large ovoid brown spot, extending over nearly one-half the length of the fruit.

Usually one spot only appears, but in one example three are seen. They were accompanied with the following note:

I send you by this mail, plum leaves covered with plant-lice, also some plums that are affected from some cause. The trees from which these plums were taken have been sprayed with strong soapsuds. What can be used to spray the trees that will kill the lice and not injure the tree and its fruit? They are becoming very thick, not only on plums, but also on cherry and peach trees.

Mr. Smith was answered that the plant-louse infesting his plum trees, was the plum-tree aphis, *Aphis pruni* Fabr. Their multiplication could have been kept down by throwing a strong soapsuds or tobacco water upon them, if it had been done earlier and before they had commenced to acquire wings. A kerosene emulsion of a moderate strength would have been still better. But unfortunately it is quite difficult to reach the insects, gathered as they are on the underside of the leaves, where they feed. They could best be reached by a Vermorel nozzle attached to the end of a rod, and throwing an upward fine spray. This species so seldom appears in destructive numbers that the above report of its presence is rather a surprise. It is probable that its numbers will show a diminution soon, although it continues on the plum throughout the season, not migrating to another food-plant, as do some other species, as notably the hop-vine aphis, *Phorodon humuli*—its associate during the early spring.

The affected fruit has been attacked by the fungus known as the "brown rot," *Monilia fructigena* Pers. For this, spraying with a copper solution would perhaps be the best that can be done, but it is not probable that it would be of much benefit at this time when the fungus has made so great progress. It should have been done, as a preventive, before the leaves expanded in the spring, and at intervals thereafter. ❏

The cherry aphis (*Myzus cerasi*) reported, is still more difficult to reach. The kerosene emulsion should have been used upon it on its first appearance, before it had multiplied to the extent of sheltering its myriads within the curled leaves which accompany its attack, where they are virtually inaccessible.

The peach-tree aphis, *Myzus persicæ* (Sulzer), although curling the foliage to a certain extent, may be more easily reached by the kerosene emulsion than the preceding species. Destructive pests as are most of the plant-lice, and of prodigious powers of multiplication, they are by no means beyond control if operations are commenced against them soon after their first appearance, or if proper sprays are applied to the plants or trees that they infest while the foliage is absent, to kill their eggs.

### The Currant Aphis, *Myzus ribis* (Linn.).

I send you with this, leaves taken from the currant bushes in my garden which show the ravages of some insect which seems to be doing considerable injury to the bushes, or rather leaves of the same, although as yet not sufficient to prevent their bearing fruit and making considerable growth. I first noticed their work some weeks ago in the crumpled appearance of the leaves—not to any great extent then, but it has steadily increased until the present time. I notice, too, of late, that a small black ant is apparently attacking or feeding on the larvæ very freely on some of the bushes.

Will you kindly inform me what the insect is, and what is the remedy for the same without injury to the bushes.—C. J. H.

Unadilla, N. Y., July 3, 1891.

The insect that curls the leaves and lives within the folds is the currant aphis, *Myzus ribis* (Linn.), which is frequently found on currant bushes from May to July. In some seasons it multiplies prodigiously and proves quite injurious, while in others it is early attacked by one of its natural enemies, the larva of the two-spotted lady-bug, *Adalia bipunctata*, and brought under control—at times completely exterminated, as was observed in my garden the present season. A minute hymenopterous parasite also frequently attacks it by depositing an egg within its body, which in a short time consumes its interior and escapes through a round hole made in its back. Nearly all of those which were found upon the leaves received from you had been destroyed in this manner, and the little parasite has apparently been rendering you valuable service.

These plant-lice, as with most other species of the family, may be killed by the application of a whale-oil soap solution, or tobacco water. As these kill by contact they must be so applied as to reach all of them—rather a difficult matter within their shelter of curled and crumpled leaves. A Vermorel nozzle attached to the hose of a force pump, will be found an efficient implement for this purpose, as, by the aid of a rod, it can be held beneath the bushes, and a mist-like spray thrown upward which should readily diffuse itself over and within the curled foliage.

Where this apparatus is not at hand, the bushes of a small garden may be treated by bending over the branches by hand and dipping and shaking them within the pail or other vessel containing the insecticide.

The little black ants that you observe in association with the aphides are not destroying them, but are giving them all the protection in their power, even by driving away some of their predaceous enemies that they may continue to feast upon the honey-dew which

the aphides give out, through the two honey-tubes that may be seen projecting backward from the upper side of their abdomen.

### Aphides and Myriapods, as Aster and Lily Pests.

A correspondent from Central New York has made inquiry of remedies for protection from some pests attacking lilies and asters.

It is important and desirable that in all cases where information of the kind is desired, that the insect complained of should accompany the inquiry. It may be possible that from the few descriptive words contained in an inquiry, recommendation of some general method may be made which is available against many insects of the family; but there are special remedies often to be employed for certain insects, and for this, specific determination of the pest of which complaint is made, is all important. Such positive determination might often, as in the present instance, in its contributing to our knowledge of our insect pests, more than compensate for the time expended in replies returned possessing no special scientific value.

Last year my aster plants, after growing finely, became yellow and ceased to make progress. On pulling up several, I found the roots covered with very minute white objects, and working actively among them were myriads of red ants. The white creatures possessed life and motion. This spring I find the same ruinous condition about the roots of self-sown seedling asters. What can I do?

My lilies suffer from the attack of small worms which eat into the stalk below the surface. The worms are as slender as pins, half an inch long, varying in color from white to shiny brown, with two conspicuous antennæ, and an infinite number of legs. The lilies are sometimes cut down by them when the stalks are as big as my thumb and full of flower-buds. Is there a method of extermination?

The aster insect is probably a root-feeding plant-louse or aphid. Professor Thomas has described a form living on roots of asters and the iron-weed, and varying in color from leaden-gray to white. As this species bears conspicuous honey-tubes, the ants associated with "the minute white objects" may have been drawn thither to feed on the honey-dew secreted by the aphides. Professor Thomas named the species *Aphis Middletonii* n. sp.\* Mr. G. W. Oestlund, in writing of this aphid as observed by him in Minnesota, refers to "the ants which were always found to attend this species." †

The root-inhabiting plant-lice may be killed by removing the ground from over the roots until they are exposed, and drenching them with soap-suds, tobacco water, or pyrethrum water. Hot water poured over

\* *Eighth Report of the Insects of Illinois*, 1879, page 99.

† Bulletin No. 4, of the Geological and Natural History Survey of Minnesota. *Synopsis of the Aphididae of Minnesota*, 1887, page 55.

the roots upon the ground would also kill the aphides, but care should be exercised not to apply it at too high a temperature, by first experimenting with a single plant.

The lily pest of which complaint is made, is, without doubt, a species



FIG. 33.—Thousand-legged worms.

of "thousand-legged worm," belonging, not to the insects, but to the Myriapoda. Many of these species are known to feed upon the roots and underground portion of the stalk of various plants. Lime water has generally been recommended for killing them, as also nitrate of soda spread about the stalks and water poured upon it to carry it into the

ground.—(*Country Gentleman*, of June 23d, 1892.)

The following notice of these insects and suggestions of remedies for them, is from the *New England Homestead* of August 24th:

*Blight in Asters.*—When asters blight or look yellow the trouble is often caused by root-lice. They are of two kinds, the white and the green. When planting, wood ashes should be raked in freely where the plants are to stand. To kill these pests, take a watering pot holding eight quarts of water and stir in three tablespoonfuls of hellebore. Water the plants thoroughly so that the water will soak in around the roots. Tobacco water or kerosene oil in dilution is also good.

Kent county, R. I.

W. H. T.

### Some Apple-tree Insects.

The fruit-growers of our county have learned to look to you for counsel and advice in time of trouble. My apple orchard is infested with more lice than all Egypt produced in the lifetime of Moses. I send you specimens in No. 1 of the most numerous of these foul insects. They cover and enwrap themselves in the foliage, and eat and destroy, as you will see on examination of what I send you. They also nest under the loose bark of the limbs and body of the tree.

There is also a green louse, not nearly so numerous, that gathers on a part of the apple which is covered by foliage, seemingly trying to hide themselves from view. They do not appear to eat the apples, but simply cluster in droves on the covered or hidden part of the fruit—perhaps doing no serious harm.

I inclose pieces of bark covered with lice which seem to be dead. There are a good many of these. Are they of any special harm to the trees; if they are, what is to be done to destroy them?

I have suffered greatly from the bud-worm—a little brown, black-headed worm or insect. I sprayed for these about the 12th of May with Paris green and London purple, but I suppose that I was ten or twelve days too late. The spraying may have affected them some, but I think not much.

I inclose some imperfect fruit, the checked development of which is probably caused by the lice destroying the foliage surrounding it. Is there any indication in the examples sent of the workings of the cod-

ling-moth worm? Would you advise any more arsenical spraying? I sprayed for the codling-moth on the 3d and 4th of the present month, and again on the 15th.

I suppose that all these fruit enemies have their period of active work, after which they retire for the season. Is there anything at this late day to be done that will be of benefit for this year? Kindly suggest anything that will promise to give relief. I have about a third of a crop of apples at the present showing, some of which are very fine and healthy looking.—N. M. R., Oswego, N. Y., June 29th.

The apple twigs sent show an unusually severe attack of the apple-tree aphid, *Aphis mali* Fabr., which is present in the different stages of its growth. The curled and blighted condition of the leaves and much of the dwarfed and distorted forms of the fruit, shown in No. 1 package, is the result of the operations of this pest.

The green lice represented as clustering on the fruit where it is covered by the foliage are probably the young of the same insect—none being on the fruit when received, and no other similar species being found on the twigs. I do not know that the apple aphid ever punctures the young apple to feed upon it; nor do I know that it ever clusters under the loose bark of the limbs and trunk of the tree.

The multiplication of this plant-louse to any approach to that now shown might have been prevented by a few sprayings with the kerosene emulsion when it first appeared; and it is not too late now to derive some benefit from this treatment.

The "pieces of bark covered with lice" show the peculiar oyster-shell scale of the apple-tree bark-louse, *Mytilaspis pomorum* (Bouché)—an extremely common pest of the apple-tree. The scale is an excretion from the insect proper which covers the eggs when deposited. These insects, minute as they are individually, but making up in their incredible numbers, are always injurious to the tree, robbing it of its vitality through the draught made upon its sap, and thus predisposing it to other insect attacks. They can best be destroyed by spraying them, at the time when the young are hatching from beneath the scale, with a strong kerosene emulsion. (See *Fourth Report on the Insects of New York*, pp. 114-120.)

The bud-worm, *Tmetocera ocellana* (Schiff.), has wrought severe injury in the orchards of Western New York this season—greater by far than known before. It should be controllable by arsenical spraying, but, to make this effective, it must be resorted to early, when the caterpillar commences to feed upon the leaf buds. Later, it is of little service. The life-history of this insect has been



FIG. 34.—Scales on apple bark of the apple-tree bark-louse, *MYTILASPIS POMORUM*.

published, but we believe has not been altogether correctly given.\* Further study will undoubtedly show some simple and effective method for preventing its destruction of the buds and blossoms and twigs.

In addition to the injury to the fruit, as stated above, by the large amount of sap drawn from the leaves and twigs by the myriads of plant-lice, a portion of it has been scarred by the burrowing into it of a "case-worm"—a species of *Coleophora*, which is being studied at present.† The small caterpillar projects its front segments from its case, and eats round holes into the apples to a moderate depth and of about the diameter of a large-sized pin. Several of the apples have been excavated or deeply pitted by a larger caterpillar—one of the "leaf-rollers," and probably *Cocœcia argyrosbila* (Walker), which is known to inflict similar injury to pears. The remedy for these two insects would be arsenical spraying. None of the fruit shows the presence of the apple-worm of the codling-moth. The timely spraying with Paris green seems to have prevented it.

During the coming month of July, most of the more destructive apple pests will have passed away, and the insects occurring then and later would be more effectively reached by a kerosene emulsion than with Paris green. The number of the sprayings during the spring and early summer should be governed by observation of the species of insects operating, and the amount of harm that they are inflicting.

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### Beet Insects.

The following inquiry in regard to serious injury to beets in the vicinity of Rochester, N. Y., was answered, as below, through the *Country Gentleman* of July 16th, 1891:

I send beet plants, and would be greatly obliged if information can be given as to what the insect is that has been affecting not only the market-gardener's sale of greens for the past three years, but also the subsequent growth of the beets.—J. H. C.

There is no one insect that is answerable for the recent injury to the beet crop mentioned above. The increased cultivation of the beet in our country, as encouraged by the beet-sugar industry, has added

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\* It has subsequently been fully worked out by Mr. M. V. Slingerland, and published in Bulletin 50, March, 1893, of Cornell University Experiment Station.

† The insect has since been described by Prof. Fernald as *Coleophora Fletcherella*. See *Canadian Entomologist*, xxiv, 1892, p. 122.

largely to the number of its attacking insects, and at present the list of its known depredators embraces sixty-four different species.

The beet plants submitted for examination, show the operations of several distinct species. The principal of these seems to be a plant-bug which punctures with its beak the leaf or stem for sucking its juices,\* and leaves an unsightly deadened spot and scar. On one of the leaves a hundred of these spots may be counted. Many of these are probably caused by that great pest of our gardens and orchards, the tarnished plant-bug, *Lygus pratensis* (Linn.). A number of these operating together upon the plant would not only mar the leaves in this manner, and render them undesirable for "greens," but would also tend to arrest the growth and development of the beet itself.

In some of the plants, irregular holes have been eaten in the leaves, which may have been by one of the several species of flea-beetles which are known to operate upon the beet in this manner. One of the most injurious of these is the "pale-colored flea-beetle," *Systema blanda* (Melsh.), while another is the very common "striped flea-beetle," *Phyllotreta vittata* (Fabr.), sometimes known as the turnip flea-beetle from its special fondness for this plant, although almost equally injurious to the radish and other of the *Cruciferae*.

On a few of the leaves transparent spots were observed, which are probably the commencement of the attack of one of the beet-leaf mining-flies. This ordinarily commences about the middle of June, and it soon increases to such an extent that the leaves can no longer be used on the table for "greens." On holding them up to the light—within large semi-transparent blotches, a goodly-sized larva or "maggot," as commonly termed, may be seen industriously cutting out and feeding upon the inner material (parenchyma) of the leaf. The growth of these larvæ is completed during the latter part of July, when they creep out from the leaves and enter the ground for pupation. Early in August the pupæ give out the perfect insect, which is a fly, somewhat resembling the common house-fly, but of a smaller size, and quite nearly allied to the onion-fly. For an account of these beet-leaf miners, of which three distinct species are known to me, my *First Report on the Insects of New York*, 1883, pp. 205-211, may be referred to.

The best protection from the injuries of the insects above noticed is probably to be found in the application to the plants at the proper time of kerosene emulsion. The proper time would be when the insects first make their appearance, as the emulsion does not drive away, but kills by contact. If made of the usual strength recommended — one part of kerosene to fifteen of water — it would not interfere with the use of the

\* See G. C. Davis, in Bulletin 102, of the Michigan Agricultural Experiment Station, 1893, p. 6.

leaves for the table after rains had washed the foliage. The emulsion would also kill the eggs of the leaf-miners which are deposited on the upper surface of the leaves.

No attack upon the beet itself (root-bulb) could be discovered, either of insect or of the nematode worms which are infesting the roots of so many of our vegetables and garden plants. Most of the beets seemed unusually small, but their dwarfing, if really such, may have resulted from impaired leafage or soil condition.

An interesting and valuable paper on the "Insect Enemies of the Sugar Beet" has lately been published by Mr. Lawrence Bruner, Entomologist of the Nebraska Agricultural Experiment Station, and contained in Bulletin 16, vol. iv, of the Station. For copies, the Station might be addressed, at Lincoln, Neb.

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### Diseased Austrian Pines.

The following communications relate to a diseased condition of Austrian pines and some other evergreens, which is not confined to the two localities indicated, but occurs elsewhere in the State,—perhaps more particularly in its southeastern portion :

*Dear Sir.*—I send you twigs of Austrian and California pines from trees in this place, showing disease, and beg the favor of information and advice either written or printed. This place is the estate of the late Colonel Howland, who was treasurer of the State in 1866. The ornamental or planted part is about 60 acres, and the trees were all carefully chosen and planted during the war, and have made excellent vigorous growth for thirty years. White pines and others have been struggling with disease for several years, and now are dying by ones and twos. But perhaps something may be done to save the others. The California (Bentham) pine has looked brownish for two years. The Austrians seem a case of sudden decay. The foliage of a whole group looks curled and dry, and boughs here and there turn brown, then yellow, and are dead. On supposition that it is caused by insect attack, I venture to address your office.

A. M. W.

MATTEAWAN, DUTCHESS Co., N. Y.

*Dear Sir.*—I send you by mail a specimen branch of an Austrian pine (*Pinus Austriaca*) showing the manner in which several of my finest trees are affected. I can not find the trace of any insect, and I would thank you if you are able to give me any explanation of the

cause and a cure for the attack. I have among the same group of trees white pine, balsam fir, red cedar, Scotch pine and Norway spruce, none of which are affected.

A. F.

MASTIC, MORICHES P. O., N. Y.

The twigs, of which an ample number were sent with the first communication (received about the middle of September) did not at the first glance show serious injury. Upon closer examination, however, the tips of many of the leaves were found to be dead, shriveled, and brown. A large number were marked with small brown spots, which in some instances showed a depression or seeming puncture, while a few of the leaves were brown and dead for most of their extent. At the end of the twigs among the bases of the leaves, pitch had exuded to an extent, presenting the appearance of an inflorescence, and clearly indicating some abnormal state.

As the cause of the condition was not apparent on a cursory inspection, a careful microscopic examination was made in order to detect, if present, the suspected attack of some gall-mite, of the family of *Phytotidae* — such as are being found to infest many of our trees, both deciduous and evergreen, in their buds and leaves — one of which was noticed in the *Country Gentleman* of October 2d, under the heading of the "Pear Leaf Blister." None could be found, nor any indication, through exuviae or eggs, of their previous occurrence. A few quite small insects of a different group were seen running rapidly over the leaves, but no part of the injury could be charged upon them. Several examples of a minute, black, shining thrips were detected upon the leaves and within the basal sheaths, but these, also, were at least harmless, and may possibly have been beneficial, as many of the species are believed to be of carnivorous habits. A few examples of a white scale-insect, *Chionaspis pinifoliae* (Fitch), occurred upon the leaves, but their number was by far too small to have occasioned any serious injury.\*

In the inability to detect insect injury, the twigs were submitted to the State Botanist, Prof. Peck, for examination for fungus attack. The brown spots and browned tips were carefully examined under a high power, but no fungoid injury could be discovered, except in the dead tips received from Mastic. In these, however, the fungus observed had evidently followed their death, and could not have been its cause.

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\*This pernicious scale has for some time been present in immense numbers on the Austrian pines in Washington Park, Albany, overspreading and whitening the surface of the leaves, and causing the death of a number of the trees, and a greatly impaired condition of others. On the worse infested trees from 100 to 200 scales could be counted on a single leaf.

It would seem, therefore, that the unhealthful and diseased condition of the evergreens is owing to some unfavorable soil condition or atmospheric influence, akin to, or possibly identical with, those that are affecting fruit trees (to an unusual extent this year), where the blossoms or leaves blight or die and are cast from the tree, and the fruit, if any, also falls. While many of the diseases infesting our trees are clearly traceable to fungus attack or bacterial presence, for others no satisfactory reason can be assigned. Among these is one which has lately been brought to my notice, as causing the death of the white pines on Beede mountain, near Keene valley, in the Adirondacks. A local name for the disease is "ring-rot," but why it should have been so called is not obvious. From account received from Forest Warden Parker, through Secretary Train of the Forest Commission, the attack is first to be seen in discoloration of the inner bark, arrest of circulation beneath it, and consequent death of the wood adjacent. It may occur on any portion of the trunk or limbs. The wood thus killed becomes brittle, valueless for working, and all that can be done is to fell the tree and convert it into lumber upon the first indication of the disease, and before it has spread.

It is not at all improbable that the affection of the evergreens in Southern New York, above noticed, is due to soil conditions. The Austrian and Californian pines might naturally be expected to respond more quickly to any unfavorable surroundings than would our native species. While the cause of this difficulty is for the present unknown, it would be well to make the experiment of applying fertilizers to the trees, in the hope that some exhausted or lacking material might be restored or given to the soil, or growth and vitality so stimulated that the disease or the attack, whatever it may be, may the better be resisted and overcome.

The State Botanist suggests that a liberal application of hard-wood ashes, would, under the apparent conditions, give promise of the best results.—*Country Gentleman*, for October 16, 1890.

NOTE.—Mr. William F. Fox, Superintendent of State Forests, has informed me of another form of "ring-rot" in the white pine long known to him, in which a decay within the trunk occurs, usually midway between the sapwood and center, and encircling the heart as a cylinder of decayed material extending from the base upward for fifteen feet or more.

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A P P E N D I X.

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(A)

## CATALOGUE OF THE KNOWN HOMOPTERA OF THE STATE OF NEW YORK IN 1851.

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The following paper by Dr. Asa Fitch, was published in the *Fourth Annual Report of the Regents of the University of the State of New York on the State Cabinet of Natural History*, 1851. Its scope is stated in the note by the author that precedes it. From the large number of original descriptions that it contains, viz., of eighty species and six genera, it has been a desideratum to many students working in this suborder, which, from the report having long been out of print, could only be supplied through the labor of transcription.

In this reprint, it is designed to reproduce the paper in its original form, *litteratum et punctuatum*, with the exception of the introduction in the text of the small reference figures, indicating corrections in the names, or notes thereon given in supplementary pages. The paging of the Fourth Report is retained in the catalogue, in brackets.

In compliance with request, Mr. E. P. Van Duzee, of the Grosvenor Library, Buffalo, N. Y., has kindly made revision of the nomenclature of the Catalogue as far as the Psyllidæ, and indicated such changes therein as are accepted at the present time. The remainder of the catalogue, comprising the Psyllidæ, Aphididæ, and Coccidæ, has been revised and annotated by Dr. C. V. Riley. The names in the catalogue unaccompanied with the reference figures are unchanged.

The case of Homoptera, arranged by Dr. Fitch, to accompany and illustrate the catalogue—each specimen indicated by name and number cut from the catalogue—was placed in the collections of the New York State Cabinet of Natural History in 1850. During ensuing years it became infested with *Anthrenus* and other museum pests, and a number of the specimens were destroyed. In 1879, those that had escaped destruction were removed and arranged with the original labels in a new case, which has since been in charge of the State Entomologist in his office in the capitol. A slip attached to the case states that it contains the TYPES of fifty-four species and five subspecies described in the catalogue. The Psyllidæ were all destroyed; of some of the Aphididæ portions are remaining. In the other families, the structural features remain for comparison, but the colors have become so seriously impaired that they would be almost valueless for study.



(C.)

CATALOGUE

WITH REFERENCES AND DESCRIPTIONS

OF THE

I N S E C T S

COLLECTED AND ARRANGED FOR THE

*State Cabinet of Natural History,*

BY ASA FITCH, M. D.

The following paper comprises all the New York *Insects of the sub-order Homoptera* known to me, except some of the minute species, to determine which required further researches. The species and genera that are here presented as new, are indicated by an asterisk preceding the scientific name, and a brief description of these, embracing their essential characters, is added. To the described species is appended a reference to the name of the author and the place where the original description will be found.

In the generic arrangement of these insects, Amyot and Serville's *Hist. Nat. des. Ins. Hemipteres*, Paris, 1843, and Westwood's *Synopsis of British Genera*, have been my chief guides. An acknowledgment is due to the Rev. D. Zeigler, of York, Pa., for a copy of Germar's paper on the genera *Clastoptera*, &c., in the *Zeitschrift f. d. Entom.*; and to Dr. T. W. Harris, of Harvard University, who has been so kind as to place temporarily in my hands his entire collection of Homoptera, including the several species named in his Catalogue, and also those magazines and other publications which contain all the more important papers of Germar, Spinola and Fallen upon this order of insects. I regret that these latter favors were not received in season for me to avail myself of them in preparing the following paper, though it is not probable they would vary it in any important point from the shape in which it is here presented.

Albany, February 22d, 1851.

# I N S E C T S .

## FAMILY CICADIDÆ.

### CICADA. LINN.

<sup>1</sup> FROSTED CICADA, *C. pruinosa*, (Say.) Jour. Acad. Nat. Sci., vol. iv., p. 330. The specimen was taken near the east end of Long Island. No. 609, male.

DOG-DAY CICADA, *C. canicularis*, (Harris.) Inj. Ins., p. 175. No. 610 male; 611, female.

CREVICED CICADA, *C. rimosa*, (Say.) Jour. Acad. Nat. Sci., vi. 235. Two specimens were taken in Washington county the middle of June, 1845. As these are the only ones I have ever met with, I am led to suspect that, like the following, this species may be periodical in the time of its appearance. No. 612, female.

<sup>2</sup> SEVENTEEN-YEAR LOCUST, *C. septendecim*, (Linn.) Syst. Nat. ii. 708. No. 613, male.

## FAMILY FULGORIDÆ.

### CIXIUS. LAT.

STIGMA-SPOTTED CIXIUS, *C. stigmatus*, (Say.) Jour. Acad. Nat. Sci., iv. 336. On various trees and shrubs. No. 614, male; 615 female.

PINE CIXIUS, <sup>0</sup>*C. pini*. Elytra with a few fulvous, cloud-like spots; destitute of a larger black stigma and black band at the base. Length to the tip of the elytra, 0.23, (twenty-three hundredths of an inch.) Found on spruce, fir, and pine. Smaller than the preceding, and evidently distinct. No. 616, male; 617, female.

4 IMPUNCTATE CIXIUS, \**C. impunctatus*. White, dorsum yellow; two bands on the front, two dots on the vertex, and two on the prothorax, black; elytra brownish-pellucid, immaculate, nerves impunctate. Length, 0.23. Found on oaks. No. 618, male.

✓ 0 Var. *a*. The whole upper half of the face black. No. 619, male.

5 FIVE-LINED CIXIUS, *C. quinquelineatus*, (Say.) Jour. Acad. Nat. Sci., vi. 241. No. 620, female.

0 DELPHAX. FAB.

6 FIELD DELPHAX, \**D. arvensis*. Pallid-yellow, immaculate; elytra and wings pellucid. Length 0.17. Common in fields of wheat early in June. No. 622, male; 623, female.

7 DORSAL-STRIPED DELPHAX, \**D. dorsalis*. Dull yellow, dorsal vitta white; elytra dusky, middle apical nerve and a small dot on the tips of the outer apical nerves black; facial carinae white, interstices black; tergum black, with a dorsal and lateral vitta orange red; legs pale yellow, striate with black. Length, 0.20. No. 621, male.

0 OTIOCERUS. KIRBY.

5 DEGEER'S OTIOCERUS, *O. degeerii*, (Kirby.) Trans. Linn. Soc., xiii. 16. On various trees. No. 624, male; 625, female.

0 COQUEBERT'S OTIOCERUS, *O. coquebertii*, (Kirby.) Tr. Linn. Soc. xiii. 18. Sometimes abundant on grape vines; also on beech and oak trees. No. 626, male; 627, female.

Var. *a*. The elytral vitta dividing into three branches. No. 628.

0 *b*. The vitta not prolonged upon the sides of the thorax. No. 629.

0 WOLF'S OTIOCERUS, *O. wolffi*, (Kirby.) Tr. Linn. Soc., xiii. 19. Taken on walnut bushes. No. 630, male.

0 ABBOT'S OTIOCERUS, *O. abbotii*, (Kirby.) Tr. Linn. Soc., xiii. 17. Taken on oaks. No. 631, male; 632, female.

0 KIRBY'S OTIOCERUS, \**O. kirbyii*. White; elytra without dots, with a faint brownish band from the middle of the inner to the apex of the outer margin, and spot on the apex of the inner margin. Length, 0.42, to the tip of the elytra. Found on oaks. No. 633, male; 634, female.

○ ANOTIA. KIRBY.

○ BONNET'S ANOTIA, *A. bonnetii*, (Kirby.) Tr. Linn. Soc., xiii. 21.

On willows, about the middle of September. No. 635, male; 636, female.

○ PÆCILOPTERA. LAT.

✓<sup>8</sup> FROSTED PÆCILOPTERA, *P. pruinosa*, (Say.) Jour. Acad. Nat. Sci., vi. 237. No. 637, male; 638, female.

○<sup>9</sup> COMMON PÆCILOPTERA, \**P. (?) vulgaris*. Blackish-pruinose; elytra with a transverse row of pellucid-white points beyond the middle; legs pallid, femurs blackish; ventral segments edged with orange; medial carina sometimes obsolete. Seems more allied to this than any other genus, though the simple neuration of its elytra, and some other marks, present discrepancies to this association. Length, 0.20. Common on various shrubs and trees. No. 639, males; 640, female.

○ FAMILY MEMBRACIDÆ.

○ ENCHOPHYLLUM. AMY. and SERV.

<sup>10</sup> TWO-SPOTTED ENCHOPHYLLUM, *E. binotatum*, (Say.) Appendix to Long's Exped., p. 301. Common on numerous plants and trees. No. 641, male; 642, female.

○ Var. *a*. Color brown. No. 643.

<sup>11</sup> BROAD-FOOTED ENCHOPHYLLUM, *E. latipes*, (Say.) App. to Long's Exp., p. 302. No. 644, female.

○ ENTILIA. GERMAR.

NOTCH-BACKED ENTILIA, *E. sinuata*, (Fab.) Entom. Syst. Suppl., p. 513. No. 645, male; 646, female.

Sub-species \**torva*. Front somewhat concave, causing the anterior foliole to incline slightly forward. No. 647.

<sup>12</sup> HOLLOW-BACKED ENTILIA, *E. concava*, (Say.) App. to Long's Exp., p. 301. That part of the generic definition which represents the thorax as "foliaceous and deeply notched" does not apply to this species. In all other respects this is so closely related to the preceding as scarcely to call for a generic separation. Both species occur on various herbs and trees, particularly on the Canada thistle, where the larvæ are, like plant-lice, attended by ants, which protect them and subsist upon their saccharine secretions. No. 648, male; 649, female.

PROPERTY OF  
Z. P. M...

○  
13 \*CARYNOTA.

(Gr. *καρά*, roundish, *νωτος*, the back.) Head broad, triangular; thorax in form of a half cone, not compressed above into a sharp or foliaceous edge; elytra with five terminal cells, the apical triangular with its end rounded; border broad, slightly wrinkled; nerves strong, elevated. Allied to *Gargara*, from which genus, however, our species are excluded by the form of the head and of the apical cellule.

○

BUTTERNUT CARYNOTA, *C. mera*, (Say.) Jour. Acad. Nat. Sci., vi. 301.  
On the butternut. No. 650, female.

○

14 OAK, OR ARCH-STRIPED CARYNOTA, *C. arquata*, (Say.) Jour. Acad. Nat. Sci., vi. 302. On different species of oaks. No. 651, female; 652, male (?)

○ SMILIA. GERMAR.

15 UNADORNED SMILIA, *S. inornata*, (Say.) Jour. Acad. Nat. Sci. vi. 299. Common on oaks, chestnut, hickory, &c. No. 653, male (?); 654, female.

Var. *a*. Edge of the keel not fuscous-black. No. 655.

○

16 UNARMED SMILIA, *S. inermis*, (Fab.) Ent. Syst., iv. 15. On oaks. No. 656, male; 657, female.

○

17 V-MARKED SMILIA, *S. vau*, (Say.) Jour. Acad. Nat. Sci., vi. 299. Abundant, particularly upon the white oak. No. 658, female.

Var. *a*. Elytra fuliginous throughout. No. 659.

○ *b*. Elytra hyaline throughout. No. 660.

○ *c*. The thoracic bands margined with black. No. 661.

○ *d*. Front tinged with sanguineous. No. 662.

○ *e*. Head white. No. 663.

○ *f*. Head white, with sparse large black punctures. No. 664.

○ *g*. Posterior thoracic band obsolete. No. 665.

○ *h*. Bands obsolete; a fulvous spot above each eye. No. 666.

○ *i*. White; apex of the thorax and a spot above each eye fulvous. No. 667.

○ *j*. Apex of the thorax white. No. 668.

<sup>18</sup> CHESTNUT SMILIA, <sup>o</sup>\**S. castaneæ*. Fuscous, more or less green when recent; head, anterior edges of thorax and all beneath, bright yellow; elytra hyaline with an apical and large longitudinal basal spot, fuscous. Length, male 0.25, female 0.30. Common on the chestnut. No. 669, male; 670, female.

♂ Var. *a*. Face with scattered fuscous dots. No. 671.

<sup>19</sup> OAK SMILIA, <sup>o</sup>\**S. quercii*. Black, with an abbreviated bright yellow dorsal vitta, which is commonly interrupted near its tip; legs pale yellow. Length, 0.22. On oaks. No. 672, male.

♂ Var. *a*. Dorsal vitta not interrupted. No. 673.

STRIPED SMILIA, <sup>o</sup>*S. vittata*, (Amyot and Serv.) Hemipt. p 539. Common on the red and black oak. No. 674, female.

Subsp. <sup>o</sup>\**guttata*. The oblique stripe replaced by a few greenish spots or dots. No. 675.

<sup>20</sup> EARED SMILIA, <sup>o</sup>\**S. auriculata*. Bright green, when faded mottled with yellow, immaculate; humeral angles somewhat salient, rounded; keel evenly rounded, much elevated, anteriorly advanced and overhanging the head; elytra scarcely exceeding the tip of the thorax. Length, from the front 0.35, from the anterior end of the keel 0.40; height 0.23. On oaks. Rare. No. 676, male.

<sup>o</sup> <sup>21</sup>\* CYRTOISA. [†]

(Gr. *κυρτος*, curved, hump-backed.) Humeral angles rounded, not salient; dorsum compressed-foliaceous, forming a regularly arched keel highest near its middle, and at most with a slight concavity posteriorly; apical cellule triangular, its end rounded. Differs from Smilia in having the keel most elevated in its middle instead of anteriorly.

<sup>22</sup> MARBLED CYRTOISA, <sup>o</sup>*C. marmorata*, (Say.) Jour. Acad. Nat. Sci., vi. 301. On oaks. No. 677, female.

<sup>23</sup> WINDOWED CYRTOISA, <sup>o</sup>\**C. fenestrata*. Yellow marbled with rufous; a pellucid spot behind the summit of the keel and a smaller one half way to the apex; an oblique yellow vitta below the anterior spot, margined with fuscous or sanguineous; tip of the thorax reaching beyond the terminal cells of the elytra. Male black, the pellucid spots almost obsolete and

the yellow vitta replaced by a few yellow dots. Length 0.25.  
On oaks. No. 678, male; 678 (bis) female.

<sup>o</sup>CERESA. AMY. and SERV.

TWO-HORNED CERESA, *C. diceros*, (Say.) App. to Long's Exp., p. 299.  
Occurs like the following, on various trees and shrubs. No.  
679, female.

BUFFALO CERESA, <sup>o</sup>*C. bubalus*, (Fab.) Ent. Syst., iv. 14. No. 680,  
male; 681, female.

Var. *a.* Sides of the thorax mottled with fuscous. No. 682.

<sup>o</sup>*b.* Under side black-brown. No. 683.

<sup>o</sup>

<sup>24</sup>\* TELAMONA.

(From *Telamones*, a synonym of *Atlantes*, in allusion to the enormous backs of these insects.) Humeral angles projecting, pointed and ear-like: dorsum compressed-foliaceous, the keel abruptly elevated at one or both its ends, forming a somewhat square crest or foliole: thorax nearly or quite reaching the tips of the elytra, with elevated longitudinal lines on each side: apical cellule triangular, its end rounded. The squarish dorsal crest forms a marked distinction between the genus here proposed, and that of *Thelia*, to which it is most nearly related.

<sup>25</sup> ONE-COLORED TELAMONA, <sup>o</sup>\**T. unicolor*. Yellow, immaculate, apex of the thorax tinged with fuscous; summit and angles of the crest rounded. Length 0.45, height 0.25. No. 684, female.

BANDED TELAMONA, <sup>o</sup>\**T. fasciata*. Yellow; thorax anteriorly and at its apex, and an oblique band crossing the posterior part of the crest fuscous; head and anterior margin of the thorax yellow, with numerous black punctures and a black dot above each eye; crest longer at its base than above, anterior end more concave than the posterior, angles rounded. Length 0.38, height 0.20. Found on walnut trees. No. 685, female.

<sup>o</sup>

HOLLOW-CRESTED TELAMONA, <sup>o</sup>\**T. concava*. Brown; a large spot on each side and a transverse band behind the crest, yellow, with sinuous black margins, the spot traversed by an interrupted

flexuous black line; summit of the crest slightly concave posteriorly, with a small yellow spot; crest contracted at its base before and more strongly behind, its posterior angle rectangular, its anterior rounded and more elevated. Length 0.42, height, 0.22. No. 686, female.

BEECH TELAMONA, <sup>o</sup>*\*T. fagi*. Black, varied with obscure cinereous; anterior half of the crest double the height of the posterior half, and elevated from it perpendicularly. Length 0.40. Taken on beech trees. No. 687, male.

WOODBINE TELAMONA, <sup>o</sup>*T. ampelopsidis*, (Harris.) Inj. Ins. p. 180. On the woodbine. No. 688, female.

<sup>27</sup> SAD TELAMONA, <sup>o</sup>*\*T. tristis*. Fuscous mottled with pallid; crest with a white line on its posterior base and one or two small pellucid spots in its upper edge; three black dots over each eye; posterior angle of the crest nearly rectangular and almost as high as the anterior, the upper edge nearly straight. Length 0.35. Found on bushes of hazelnut, &c. No. 689, female.

HAZELNUT TELAMONA, <sup>o</sup>*\*T. coryli*. Pale dull yellow; an abbreviated band occupying the anterior end of the crest, a curved and fuscous-margined band crossing its posterior end, and the apex of the thorax, ferruginous; form of the crest similar to that of <sup>o</sup>*tristis*. Length 0.32. Taken on hazelnut bushes. No. 690, female.

<sup>30</sup> OAK TELAMONA, <sup>o</sup>*\*T. querci*. Green, freckled with yellow, fading to dull yellow punctured with black; crest with a pale yellow vitta on its posterior edge; angles of the crest rounded, the anterior much higher than the posterior. Length 0.40. On different species of oak. No. 691, male; 692, female.

RECLIVATE TELAMONA, <sup>o</sup>*\*T. reclivata*. Greenish white; a sub-interrupted band crossing the back part of the crest, a stripe at its posterior base and the apex of the thorax brownish black; anterior end of the crest strongly inclined backwards, rectilinear. Length 0.35. On oaks and chestnut. No. 693, female.

6 THELIA. AMY. and SERV.

TWO-SPOTTED THELIA, <sup>0</sup>*T. bimaculata*, (Fab.) Entom. Syst. iv. 10.  
Occurs on the locust. No. 694, male.

SINGLE-STRIPED THELIA, <sup>0</sup>*T. univittata*, (Harris.) Inj. Ins., p. 180. On  
oaks. No. 695, male; 696, female.

THORN-BUSH THELIA, <sup>0</sup>\**T. cratægi*. Fuscous varied with black and  
white; thorax with two broad white bands margined with  
black, the anterior narrowed on the front and notched on each  
side at the base of the foliole. Length, 0.34; height, 0.13; to  
the apex of the foliole, 0.26. On the thorn. No. 697,  
female.

0 TRAGOPA. GERM.

<sup>0</sup>29 DORSAL TRAGOPA, \**T. dorsalis*. Greenish-white, polished; elytra  
hyaline; occiput, pectus, and large dorsal spot sending a  
branch towards each eye, black. Males black, with the face,  
apex of the thorax, the abdomen and feet greenish-white.  
Length, 0.20. On grape vines. No. 698, male; 699,  
female.

0 UROXIPHUS. AMY. and SERV.

<sup>0</sup>30 WALNUT UROXIPHUS, *U. caryæ*. Dull brown; elytra towards  
the apex obscure-cinereous; abdomen and annulus on the tibiæ  
pale yellowish; sternum pruinose-white. Length, male, 0.30;  
female, 0.37. On the walnut and pig-nut. No. 700, male;  
701, female.

0 Var. *a*. Femurs rufous, tibiæ and base of the hind tarsi pale  
yellow. No. 702.

0 FAMILY CERCOPIDÆ.

0 APHROPHORA. GERM.

FOUR-SPOTTED APHROPHORA, <sup>0</sup>*A. quadrinotata*, (Say.) Jour. Acad.  
Nat. Sci., vi. 304. Taken on grape vines. No. 703, male;  
704, female.

0 Var *a*. Elytra nearly hyaline. No. 705.

○ LEPYRONIA. AMY. and SERV.

FOUR-CORNERED LEPYRONIA, *L. quadrangularis*, (Say.) Jour. Acad. Nat. Sci., iv. 335. Common in autumn and spring in groves of the sugar-maple, where numbers may often be met with, drowned in the vessels of sap. No. 706, male; 707, female.

<sup>31</sup> PARALLEL-MARKED LEPYRONIA, *L. parallella*, (Say.) App. to Long's Exp., p. 303. Common on the white pine. No. 708, male; 709, female.

<sup>32</sup> SARATOGA LEPYRONIA, \**L. saratogensis*. Pale fulvous varied with white; anterior and posterior margins of the vertex parallel. Closely related to *parallella*, but that has the vertex crescentiform, is much darker colored, and is confluent nigropunctate. Here the punctures are uncolored. Length, 0.40. Common on the pitch pines of Saratoga plains and is sometimes met with on the white pine also. No. 710, male; 711, female.

○ Var. *a*. Dorsal vitta obsolete; elytra pellucid-white. No. 712.

○ CLASTOPTERA. GERM.

OBTUSE CLASTOPTERA, *C. obtusa*, (Say.) Jour. Acad. Nat. Sci., iv. 339. If this is not the *C. achatina*, Germ., that species is unknown to me. No. 713, male; 714, female.

TESTACEOUS CLASTOPTERA, \**C. testacea*. Testaceous; scutel rufous; elytra with a polished callous-like black dot near the apex. Length, 0.20. Found on oaks and pines. No. 715, female.

Var. *a*. A black callous-like dot on each side of the pectus. No. 716.

○ *b*. Pectoral dots present, elytral dots wanting. No. 717.

○ *c*. The black dots wanting, both on the elytra and pectus. No. 718.

<sup>33</sup> PINE CLASTOPTERA, \**C. pini*. Black; head yellow, with a black band on the anterior margin of the vertex; thorax with a yellow band anteriorly; elytra with a broad hyaline outer

margin interrupted in the middle, and a black callous dot near the apex. Length, 0.14. Found chiefly on pines. No. 719, male.

Var. *a*. A ferruginous dot on the apex of the scutel. No. 720.

*b*. The yellow thoracic band widely interrupted. No. 721.

PROTEUS CLASTOPTERA, *\*C. proteus*. Head bright yellow, a black band on the anterior margin of the vertex and a broader one on the front; front polished, without transverse striæ; a callous black dot near the apex of the elytra; legs yellowish-white, tarsi black. Length, 0.16; males slightly smaller. Abundant on the paniced dog-wood, (*Cornus paniculata*). Closely allied to the *C. atra* (Germar,) but on examining a host of specimens, not one occurs in which the legs are annulated with black or fuscous. No. 722, female.

This pretty insect, though so small in size, presents an astonishing number of sub-species and varieties, so clearly and distinctly marked that at first glance they would be confidently regarded as well characterized species. The following are the more prominent, though by no means all, of the varieties that occur:

Sub-sp. *i. flavicollis*. Thorax entirely yellow. .

Var. *a*. Elytra yellow. No. 723.

*b*. Elytra with an oblique blackish vitta. No. 724.

Sub-sp. *o. cincticollis*. Thorax with a black band.

Var. *a*. An interrupted black band on the anterior margin of the thorax. No. 725.

*b*. An entire black band on the anterior margin of the thorax. No. 726.

*c*. Thoracic band crossing the disk instead of the anterior margin. No. 727.

*d*. Band on the disk of the thorax, and scutel black. No. 728.

Sub-sp. *o. maculicollis*. Thorax with one or two discoidal spots.

Var. *a*. A black spot on the disk and interrupted band anteriorly. No. 729.

o b. A black spot on the disk and anterior band entire.

o No. 730.

c. Two black spots on the disk of the thorax.

No. 731.

Sub-sp. *nigricollis*. Thorax black, with a yellow band forward of the disk.

o Var. *a*. The black band on the anterior margin of the thorax interrupted. No. 733.

o b. The band continuous. No. 734.

o c. Scutel black, with a yellow dot at its base. No. 735.

o d. Scutel entirely black. No. 736.

### o FAMILY TETTIGONIIDÆ.

#### o TETTIGONIA. GEOFF.

FORK-STRIPED TETTIGONIA, *T. bifida*, (Say.) Jour. Acad. Nat. Sci., vi. 313. On grass in meadows. No. 737, male; 738, female.

o Var. *a*. The usual three white dots in the black frontal spot confluent, forming a lunule. No. 739.

o b. Two white dots only on the front. No. 740.

o c. The orange color on the sides of the front replaced by black. No. 741.

o THREE-DOTTED TETTIGONIA, \**T. tripunctata*. White; vertex with two black dots on the disk and a third on the apex; thorax with two pale brown bands; elytra pellucid-white, the longitudinal nervures brown, except at their tips; head longer and more pointed than in the preceding species. Length, 0.20. Taken on dog-wood. No. 742, male.

#### o PROCONIA. LEPEL. and SERV.

<sup>34</sup> FOUR-STRIPED PROCONIA, *P. quadrivittata*, (Say.) Jour. Acad. Nat. Sci., vi. 312. In having the vertex flattened, this and the succeeding species are widely separated from the two foregoing. Common, on various shrubs. No. 743, male; 744, female.

- Var. <sup>o</sup>a. Spots on the thorax sanguineous. No. 745.  
<sup>o</sup>b. Thorax with two black spots at its base. No. 746.  
<sup>o</sup>c. Thorax margined with black at its base. No. 747.  
<sup>o</sup>d. Disk and base of thorax green, immaculate. No. 748.  
<sup>o</sup>e. Thorax with a green mark shaped like a trident, based on its posterior margin. No. 749.

<sup>o</sup>AULACIZES. AMY. and SERV.

- <sup>35</sup> TENDER-FOOTED AULACIZES, <sup>o</sup>*A. mollipes*, (Say.) Jour. Acad. Nat. Sci., vi. 312. Common on the grass of meadows and pastures. No. 750, male; 751, female.  
<sup>36</sup> NEW YORK AULACIZES, <sup>o</sup>\**A. noveboracensis*. Yellow; elytra and large spot at the base of the thorax, olive-green; no black vitta on the sides of the pectus; head shorter, broader, and its apex more obtuse, than in <sup>o</sup>*mollipes*. Length, 0.33. Rare. On grass in meadows. No. 752, female.

<sup>o</sup>\*HELOCHARA.

(*Gr. ἔλος*, a marsh, *χαίρω*, to rejoice.) Head, obtuse-triangular, broader than long, slightly broader than the thorax, the transversely striated front reflected over on to the anterior sides of the vertex; vertex with a slight longitudinal stria; ocelli on the vertex, farther from each other than from the eyes; tips of the male antennæ knobbed; elytra with five terminal and three discoidal cells. By its knobbed antennæ, this genus occupies a similar rank to the sub-family <sup>o</sup>*Tettigonides*, that <sup>o</sup>*Idiocerus* does in that of <sup>o</sup>*Jassides*.

- <sup>37</sup> COMMON HELOCHARA, <sup>o</sup>\**H. communis*. Dark green; females grass-green, when faded variously mottled with tawny yellow; beneath, more or less black, legs testaceous. Length, 0.20. On grass in marshy situations, often excessively numerous. No. 753, male; 754, female.  
<sup>o</sup>Var. *a*. The usual transverse row of large punctures on the foreside of the thorax obsolete. No. 755.

10 EVACANTHUS. LEPEL. and SERV.

- ✓ 0 ORBITAL EVACANTHUS, \**E. orbitalis*. Black, shining; orbital margins, antennæ and legs, tawny white; elytra deep fuscous, nerves and large spot at the apex of the outer margin white; face with a tawny white, transverse spot or band above. Length, 0.18, to tip of female abdomen 0.20. On dogwood, the last of July. Rare. No. 756, male.

✓ GYPONA. GERM.

- ✓ 88 YELLOW-STRIPED GYPONA, \**G. flavilineata*. Pale green, immaculate; thorax with eight pale yellow vittæ, the middle ones common to the vertex and scutel. ✓ 0 *Tettigonia 8-lineata*, var. *a*, of Say. Having never met with specimens possessing rosaceous stripes and nervures, and this insect being larger in size than the ✓ 8 *8-lineata*, I am induced to regard it as a distinct species. Length, 0.35 to 0.45. Common on oaks, maple, walnut, &c. No. 757, male; 758, female.

- ✓ RED-MOTTLED GYPONA, \**G. scarlatina*. Dull yellowish brown; elytra with rosaceous nerves and dots; thorax without vittæ; common disk of the elytra sparsely dotted with black; length, 0.40. No. 759, female.

✓ PENTHIMIA. GERM.

- ✓ AMERICAN PENTHIMIA, \**P. americana*. Black; elytra white towards the apex; two dots on the anterior edge of the vertex, and a spot on each outer angle of the thorax sanguineous or rufous. Female, with the vertex, thorax, scutel and venter, sanguineous. Closely allied to the European varieties *hemorrhoea* and *sanguinicollis*, (Fab.) but is a size larger. Length, 0.23. Rare. Taken on the sugar maple. No. 760, male; 761, female.

0 ACOCEPHALUS. GERM.

- ✓ 39 YELLOW ACOCEPHALUS, \**A. vitellinus*. Yellow; elytra longer than the abdomen, with pellucid spots, and on the margins towards the apex a few black dots. Length, 0.26. Found on the sugar maple. No. 762, male.

- Var. *a*. Four faint tawny yellow vittæ on the thorax, and an oblique tawny band across the middle of the elytra. No. 763, female.

○ CÆLIDIA. GERM.

- 40 BANDED CÆLIDIA, *C. subbifasciata*, (Say.) Jour. Acad. Nat. Sci., vi. 310. Found on beech trees. I have also taken this species in Kentucky and Illinois. No. 764, female.
- 41 GARDEN CÆLIDIA, *C. olitoria*, (Say.) Jour. Acad. Nat. Sci., vi. 310. Taken on raspberry bushes. No. 765, female.

○ BYTHOSCOPIUS. GERM.

- 42 BLACK-BACKED BYTHOSCOPIUS, *\*B. tergatus*. Sordid green immaculate; elytra smoky; tergum black; beneath greenish yellow; tarsi pale brown. Length, 0.30. On willows. No. 766, male.
- 43 ONE-COLORED BYTHOSCOPIUS, *\*B. unicolor*. Greenish-yellow, immaculate; elytra hyaline; length, 0.28. Taken on flowers of goldenrod. No. 767, female.
- 44 HALF-CLOTHED BYTHOSCOPIUS, *B. seminudus*, (Say.) Jour. Acad. Nat. Sci., vi. 307. Found on birch trees. No. 768, female.
- 45 SADDLED BYTHOSCOPIUS, *B. clitellarius*, (Say.) Jour. Acad. Nat. Sci., vi. 309. On various herbs and shrubs. No. 769, male; 770, female.
- 46 PINE BYTHOSCOPIUS, *B. \*strobi*. Yellowish-brown; elytra with three white bands, and closely inscribed with fuscous points and lines, outer margin with small fuscous spots; beneath brown; legs pallid, with spine-bearing black dots. Length, 0.20. Common on pines in May. No. 771, male; 772, female.

○ IDIOCERUS. LEWIS.

- WEEPING IDIOCERUS, *\*I. lachrymalis*. Brown varied with white; elytra hyaline, immaculate, nerves fuscous; a black spot at the anterior edge of each eye; two remote black dots on the fore side of the vertex commonly connected by a transverse black line; scutel with a transverse black spot on the disk and two triangular ferruginous spots at the base. Length, 0.28.

Taken on poplar and walnut trees. No. 773, male; 774, female.

Var. *a.* The black frontal line prolonged to the spots forward of the eyes. No. 775.

*b.* The usual small black spot beneath each ocellus wanting. No. 776.

*c.* The black frontal line wanting. No. 777.

*d.* One or two small four-sided discoidal cells in the elytra in addition to the usual number. No. 778.

<sup>o</sup>  
47 ALTERNATE-MARKED IDIOCERUS, \**I. alternatus*. Brown varied with white; elytra hyaline, immaculate, nerves fuscous with white alternations; two remote black dots on the anterior edge of the vertex; scutel with two dots on its disk and two triangular spots at its base black. Length, 0.22. Common, on willows. No. 779, male; 780, female.

<sup>o</sup>  
SPOTTED-WINGED IDIOCERUS, \**I. maculipennis*. Chestnut-brown varied with white; elytra hyaline, with a large fuscous spot on the middle and another at the apex of the outer margin, with an intervening white spot; a faint white spot towards the base of the sutural margin. Length, 0.25. Taken on thorn bushes No. 781, female.

<sup>o</sup>  
SUTURE-STRIPED IDIOCERUS, \**I. suturalis*. Yellowish white; elytra hyaline with a dusky vitta on the suture, and two dusky spots on the base of the scutel. I have never met with the males of this and the following species, but their facial ocelli and elytral neuration indicate this to be their generic place. Length, 0.25. Taken on chestnut trees. No. 782, female.

<sup>o</sup>  
PALE IDIOCERUS, \**I. pallidus*. Greenish white, immaculate; elytra hyaline. Length, 0.22. On poplars and willows. No. 783, female.

<sup>o</sup> <sup>o</sup> PEDIOPSIS. BURM.

GREEN PEDIOPSIS, \**P. viridis*. Light green, immaculate; elytra pellucid, almost hyaline. Length, 0.18. No. 784, female.

THREE-SPOTTED PEDIOPSIS, \**P. trimaculatus*. Dull brown; scutel with a black spot at each angle, the posterior one sometimes obsolete; elytra with pellucid white spots situated one on the apex, one on the disk and a third anteriorly, scutellar region obscure cinerous; face whitish. Length, 0.18. No. 785, female.

ATHYSANUS. BURM.

To this genus we refer those species which differ from *Macropsis* and *Pediopsis* in having the ocelli between the vertex and the face, and from *Jassus* in having the elytral suture straight.

48 VARIABLE ATHYSANUS, \**A. variabilis*. Sulphur-yellow; elytra commonly with an oblique black vitta, their tips pellucid; vertex, thorax and scutel often fulvous or black. Length, 0.20. Abundant on birch trees, in June. No. 786, female.

○ Var. *a*. Dull yellowish-white throughout. No. 787.

○ *b*. Bright sulphur-yellow throughout. No. 788.

○ *c*. An oblique black stripe on each elytron. No. 789.

○ *d*. Vertex, thorax and scutel tawny yellow. No. 790.

○ *e*. Vertex and thorax tawny yellow, scutel black. No. 791.

○ *f*. Vertex, thorax and scutel black. No. 792.

49 SPRUCE-TREE ATHYSANUS, \**A. abietis*. Black, shining; head light yellow, mouth and two bands on the vertex confluent at their ends, black; middle of the sutural edge of the elytra with a white streak. Length, 0.20. Taken on the black spruce. No. 793, female.

50 WINDOWED ATHYSANUS, \**A. fenestratus*. Brownish-black; face and scutel rufous; elytra each with a pellucid spot near the apex, another on the disk, and a third opposite this last on the sutural margin. Length, 0.20. On birch trees. No. 794, female.

51 SMALLER ATHYSANUS, \**A. minor*. Cinnamon yellow; elytra with a discoidal and large apical spot hyaline. Length, 0.18. Common on birch trees. No. 795, female.

<sup>52</sup> BEECH-TREE ATHYSANUS, \**A. fagi*. Elytra fuscous, immaculate; scutel, face and pectus black; venter and legs light yellow. Length, 0·18. Taken on beech trees. No. 796, female.

<sup>53</sup> BLACK-NOSED ATHYSANUS, \**A. nigrinasi*. Pale yellow, lower part of the face black or fuscous. Length, 0·18. Common, particularly upon the hornbeam (*Carpinus americana*.) Presents many varieties. No. 797, female.

○  
AMBLYCEPHALUS. CURTIS.

<sup>54</sup> CURTIS'S AMBLYCEPHALUS, \**A. curtisii*. Greenish yellow; two dots on the vertex, band on fore part of the thorax, and six vittæ on each elytron, black; beneath black. Length, 0·15. Common particularly on the grass of meadows. No. 798, male; 799, female.

<sup>55</sup> SAY'S AMBLYCEPHALUS, \**A. sayii*. Pale yellowish, without dots; elytral cells partially margined with fuscous or black, nerves white. Length, 0·13. Abundant on grass in pastures and meadows. No. 800, male; 801, female.

Var. <sup>○</sup>*a*. A black spot on the base of the thorax. No. 802.

<sup>○</sup>*b*. Three black spots on the base of the thorax. No. 803.

<sup>○</sup>*c*. Only the apical cells margined with fuscous at their tips. No. 804.

<sup>56</sup> MELSHEIMER'S AMBLYCEPHALUS, \**A. melsheimerii*. Pallid, base of the tergum black; elytra pellucid, nerves white. Length, 0·10. Common on grass. No. 805, male; 806, female.

<sup>57</sup> INIMICAL AMBLYCEPHALUS, <sup>○</sup>*A.?* *inimicus*, (Say.) Jour. Acad. Nat. Sci., vi. 305. Though this much resembles the species named <sup>○</sup>*Sayii*, above, it differs from this genus by the length of its elytra, and from <sup>○</sup>*Jassus* by its striated front and the number of its discoidal and apical cells. It probably forms the type of a separate genus. Common on grass, and its larva has been said to depredate upon the roots of young wheat. No. 807, male; 808, female.

○ Var. *a*. Nerves white, cells margined with fuscous.

No. 809.

- <sup>0</sup>b. Two smaller dots between the ordinary ones on the head. No. 810.
- <sup>0</sup>c. Two dots only on the neck. No. 811.
- <sup>0</sup>d. Dots on the neck all wanting. No. 812.

<sup>0</sup> JASSUS. FAB.

<sup>58</sup> FRECKLED JASSUS, \**J. irroratus*, (Say.) Jour. Acad. Nat. Sci., vi. 308. Common on herbage. No. 813, male; 814, female.

<sup>0</sup>Var. *a*. A transverse row of five white dots on the anterior edge of the head. No. 815.

<sup>59</sup> YELLOW-BACKED JASSUS, \**J. fulvidorsum*. Head, thorax and scutel sordid yellow, uninscribed; elytra white, closely inscribed with fuscous lines and points, and on the outer margin irregular spots. Length, 0.25. On pines. No. 816, male, 817, female.

<sup>60</sup> POINTED JASSUS, \**J. acutus*, (Say.) Jour. Acad. Nat. Sci., vi., 306. Found on hornbeam. No. 818, male.

<sup>0</sup><sub>61</sub> \*ERYTHRONEURA.

(Gr., ερυθρος red, νευρον, nerve; in allusion to the color of portions of the elytral nerves in several of the species.) Head crescentiform, about as broad as the thorax; vertex rounded down to the front without an angular edge; ocelli between the vertex and the front, almost as near each other as to the eyes; elytra without closed cells in the disk; apical cells four, longish; middle apical nerve simple. Forward of the transverse nerve the exterior and middle nerves are sometimes obsolete. For a group of our small *Jassides*, whose elongated linear bodies give them the aspect of *Tettigoniides*, no place appears among the genera defined by Amyot and Serville. This and the following genus is therefore proposed for their reception.

<sup>62</sup> WOUNDED ERYTHRONEURA, \**E. vulnerata*. Fulvous-brown spotted and lined with whitish; elytra with an abbreviated yellowish-white vitta on the outer margin, interrupted near the middle by an oblique black line, and towards the apex by an oblique sanguineous one; tips dusky, with whitish nervures and spots; a whitish medial line common to the vertex, thorax and scutel; beneath black, legs pallid. Length, 0.12. On

raspberry bushes, grape-vines and other situations where the foliage is dense, often in great numbers. No. 819, male; 820, female.

<sup>o</sup>  
 63 GRAPE-VINE ERYTHRONEURA, *E. vitis*, (Harris.) Inj. Ins., p. 184.  
 Inhabits with the preceding. No. 821, female.

<sup>o</sup>  
 64 ALLIED ERYTHRONEURA, \**E. affinis*. Pale yellow; elytra hyaline, spotted with light yellow, with a black dot on the inner margin towards the apex, and a broad yellowish brown band on the base. Allied to <sup>o</sup>*basillaris* Say, but readily distinguished, being destitute of sanguineous markings. Length, 0.12. No. 822, female.

<sup>o</sup>  
 65 THREE-BANDED ERYTHRONEURA, \**E. tricolorata*. Pale yellow, with three broad bands, the anterior velvet-black, occupying the thorax and basal half of the scutellum; the middle bright ferruginous ending outwardly in black, forward of the middle of the elytra, the posterior dusky brown, on the apex. Length, 0.12. No. 823, female.

Var. *a*. Anterior band sanguineous. No. 824.

<sup>o</sup>  
 66 OBLIQUE-STRIPED ERYTHRONEURA, *E. obliqua*, (Say.) Jour. Acad. Nat. Sci., iv. 342. No. 825, male.

<sup>o</sup>  
 67 BEAN-VINE ERYTHRONEURA, *E. fabae*, (Harris.) Inj. Ins., p. 186.  
 No. 826, male; 827, female.

<sup>o</sup>  
 68 \*EMPOA.

~ (Gr. ἐν, upon, ποα, herbage.) Differs from Erythroneura in having the apical nerve widely forked, forming a triangular apical cell, which is shorter than the three other terminal cells.

<sup>o</sup>  
 69 OAK EMPOA, *E. querci*. White; elytra pellucid, with three blackish dots in a transverse row behind the middle. Length, 0.12. On oaks, sometimes excessively numerous. No. 828, female.

<sup>o</sup>  
 70 SCARLET EMPOA, *E. coccinea*. Scarlet-red, immaculate, pectus and venter orange, elytra brownish-pellucid. Length, 0.10. Taken on pines. No. 829, male.

## FAMILY PSYLLIDÆ.

## PSYLLA. GEOF.

<sup>71</sup> **THREE-DOTTED PSYLLA**, \**P. tripunctata*. Wax-yellow, dorsum black; legs and antennæ pale yellow, the latter black at the tips; elytra hyaline, nerves brown, beyond the furcation widely margined with smoky-fulvous, a blackish dot on the middle of the terminal margin of each of the inner apical cells. Length 0·16. No. 830, female.

**FOUR-LINED PSYLLA**, \**P. quadrilineata*. Bright fulvous; elytra hyaline, nerves blackish; four whitish longitudinal lines on the middle of the metathorax; abdomen black with a yellow band at its base. Length, 0·12. No. 831, female.

**HORNBEAM PSYLLA**, \**P. carpini*. Light-green or greenish yellow; elytra hyaline, nerves light-green. Length, 0·16. Common on the hornbeam, in July. No. 832, male; 833, female.

<sup>72</sup> **ANNULATED PSYLLA**, \**P. annulata*. Straw yellow; legs white; elytra hyaline, nerves straw yellow; antennæ black, basal half straw-yellow annulated with black. Length, 0·15. Occurs on the sugar-maple. No. 834, male; 835, female.

## LIVIA. LAT.

**VERNAL LIVIA**, \**L. vernalis*. Bright ferruginous; pectus and tips of antennæ black; legs ferruginous-pallid. Length, 0·15. Found in spring in vessels of sap of the sugar-maple. No. 836, male; 837, female.

**BLACK-LEGGED LIVIA**, \**L. femoralis*. Bright ferruginous; pectus, four forward femurs and tips of the antennæ black. Perhaps not distinct from the preceding. Length, 0·15. Taken on a pine tree, in July. No. 838, female.

## FAMILY APHIDÆ.

## APHIS. LINN.

- APPLE-TREE APHIS, *A. mali*, (Fab.) Ent. Syst. iv. 216. Common on the under side of the leaves and tips of the young branches of the apple-tree. No. 839, male.
- <sup>73</sup> CHERRY-TREE APHIS, <sup>O</sup>*A. cerasi*, (Fab.) Ent. Syst. iv. 211. Common on the under side of the leaves of the garden cherry, (*Cerasus vulgaris*, Mill.) No. 840, male.
- <sup>74</sup> CHERRY-INHABITING APHIS, \**A. cerasicolens*. Pale greenish yellow; antennæ and legs black, base of the femurs pallid; nerves of the fore wings dusky, stigma pellucid white; abdominal horns quite short. When irritated, the legs and antennæ instantly emit from their pores a bluish white cotton-like substance, which remains adhering to them, resembling fine mould. Length, 0·20, to the tips of the wings. On the common black-cherry-tree, (*Cerasus serotina*, DC.) No. 841, male.
- <sup>75</sup> BERBERRY APHIS, <sup>O</sup>\**A. berberidis*. Black; pectus and abdomen pale yellow, tip black; legs dusky; larva and pupa pale, with a green or black vitta on each side of the back, parallel with the outer margin. Length, 0·10. On the under side of berry leaves. No. 842, male; 843, female.
- CABBAGE APHIS, *A. brassicae*, (Linn.) Syst. Nat. ii. 734. Common on the under side of cabbage leaves. No. 844, male.
- <sup>76</sup> SILK-WEED APHIS, <sup>O</sup>\**A. asclepiadis*. Black; abdomen pale green; sides with two rows of impressed fuscous dots, three in the lower, larger, five in the upper; abdominal horns nearly equalling the tip; stigma smoky whitish; nerves brown; the costal whitish. Length, 0·15. On the lower surface of young leaves of the common silk-weed. No. 845, male.
- DOGWOOD-LEAF APHIS, \**A. cornifoliae*. Apterous females black, sub-pruinose, obovate; legs pale yellow, feet black; antennæ pale yellow, tips black; horns nearly equalling the truncated tip of the abdomen. Length, 0·05, to tip of abdomen. On the under surface of the leaves of *Cornus paniculata*. No. 846, female.

THORN-LEAF APHIS, \**A. crataegifolia*. Black; abdomen green, with a row of blackish dots along each side; nerves of the fore wings whitish, black at their tips; tibiæ, except at their tips, and base of the femurs, green; horns nearly half equalling the tip of the abdomen. Length, 0·15. On the leaves of *Crataegus punctata*, corrugating them. No. 847, male.

<sup>77</sup> BIRCH-INHABITING APHIS, \**A. betulæcolens*. Sulphur yellow; antennæ deep black, two basal joints sulphur-yellow, the following joints white at their bases; stigma pellucid yellowish; nerves black, the costal and marginal sulphur-yellow, base of the forked nerve hyaline; horns very short. Length, 0·18. No. 848, male.

<sup>78</sup> MAPLE-TREE APHIS, *A. aceris*, (Linn.) Syst. Nat. ii. 736. Our insect appears to correspond with the brief description given of this species. Occurs on the *Acer pennsylvanicum*. No. 849, male.

ELDER-LEAF APHIS, \**A. sambucifolia*. Black; tibiæ and base of the femurs pallid; stigma dusky; nerves black, the furcate one hyaline at its base. Length, 0·15. On the under side of the leaves of the elder. No. 850, male.

PINE-INHABITING APHIS, \**A. pinicolens*. Straw-yellow, densely pruinose; antennæ black, bases pallid, with a fuscous annulus; fore wings with a fuscous spot on the apex of each nerve; nerves brown, hyaline at their bases, the costal straw-yellow; horns very short. Length, 0·25. Solitary on the pine. No. 851, male.

<sup>79</sup> POPLAR-LEAF APHIS, \**A. populifolia*. Chestnut-brown, pruinose; legs hairy, black, above the knees pale brown; stigma smoky fulvous, margined with black; nerves brown; tergum with two dorsal rows of impressed, quadrate, fuscous spots, and on each side two rows of impressed dots; horns equalling a third of the distance to the tip. Length, 0·22. On the leaves of the *Populus grandidentata*. No. 852, male.

<sup>80</sup> CONE-FLOWER APHIS, \**A. rudbeckia*. Red; antennæ and legs black; basal half of the femurs pale yellow; horns equalling the tip; stigma yellowish; nerves brown, the costal sulphur-yellow. Length, 0·20. Infests the upper part of the stalks of *Rudbeckia laciniata*, *Solidago serotina* and *S. gigantea*. No. 853, male.

## LACHNUS. ILLIG.

SPRUCE-TREE LACHNUS, \**L. abietis*. Apterous females pubescent, broad oval, blackish clouded with lurid brown, with a faint cinereous dorsal vitta; venter lurid, pruinose, with a black spot near the tip; antennæ sordid-white, with a black annulus at the apex of each joint. Length, 0.15 to tip of the abdomen. Occurs on the *Abies nigra*. No. 854, female.

OAK-LEAF LACHNUS, \**L. quercifolia*. Light yellow; antennæ pellucid white, with a slender black annulus at the tip of each joint; fore wings with a blackish spot on the apex of each nerve and a deep black dot on the base of the curved apical nerve; stigma whitish. Length to tip of wings, 0.15. On the leaves of the white oak. No. 855, male.

WILLOW LACHNUS, \**L. salicellis*. Black; tibiæ and base of the antennæ obscure pallid; base and costal margin of the fore wings yellowish-white. Length, 0.08. On the young succulent twigs of willow trees. No. 856, male.

ALDER-LEAF LACHNUS, \**L. alnifolia*. Apple-green; antennæ greenish-white, with four black annuli; legs greenish-white, tarsi, knees, and line on the posterior side of the tibiæ black; wings hyaline, the three oblique nerves black. Length, 0.10. On alder leaves. No. 857, male.

<sup>81</sup> ELM LACHNUS, *L. ulmi*, (Linn.) Syst. Nat. ii. 733. Solitary, on the under side of elm leaves. No. 858, male.

<sup>82</sup> POPLAR LACHNUS, *L. populi*, (Linn.) Syst. Nat. ii. 736. On the under side of the young leaves of *Populus grandidentata*. No. 859, male; 860, larva.

## ERIOSOMA. LEACH.

<sup>83</sup> APPLE-TREE BLIGHT, *OE. lanigera*, (Hausman.) Illiger's Magaz. vol. i. p. 440. *Myzoxylus mali*, (Blot.) Mem. Soc. Agric. de Caen, 1830, p. 38. On the bark of young branches of the apple, to which tree, in Europe, it has been a great pest. Commonly only solitary individuals are here found, and in but one instance, have I met with it clustered and covering a limb as described by foreign writers. No. 861, male.

- <sup>84</sup> APPLE-ROOT BLIGHT, *E. pyri*. Black, more or less pruinose, with a tuft of cotton-like down on the tergum and commonly a smaller one on the head; fore wings hyaline, with a black stigma and nerves, the externo-medial nerve hyaline towards its base; inner edge black from the base to the apex of the first nerve, hyaline beyond. Length, 0.20. Common on the wing in groves, in autumn. On the roots of a young apple tree brought me from a nursery, excrescences were observed, the crevices in which were found to be covered with small lice-like larvæ, among which some winged individuals occurred which proved on examination to be this species, from which circumstance its habits are inferred and its name bestowed. No. 862, male.
- <sup>85</sup> ALDER BLIGHT, *E. tessellata*. Dull bluish-black; tergum with the segments marked by strongly impressed lines and covered by white down in square checker-like spots. Length, 0.16. On the under side of branches of the alder, (*Alnus rubra*, Marsh.) crowded together and concealed beneath a dense covering of snow-like down. I have searched in vain for winged individuals of this species. No. 863.
- <sup>86</sup> BEECH-TREE BLIGHT, *E. imbricator*. Black; three last segments of the abdomen blue-pruinose; stigma brown; longitudinal nerve and a line on the middle of the inner margin black. Female (?) winged; abdomen fulvous, with a black spot on the disk; legs pallid. Larva pallid, with 2 fuscous dorsal stripes; posterior half of the abdomen covered with a tuft of cotton-like down, from which proceeds two longer and coarser filaments. Length, 0.22. On the under sides of the branches of the beech tree, covered with snow-white down. On the slightest jar of the branch, a shower of tiny drops of a water-like fluid falls from these insects. Having met with no description of the *E. fagi*, (Linn.), or its habits, I am unable to ascertain whether that insect is dissimilar to ours. No. 864, male; 865, female (?); 866, larva.

<sup>87</sup> PINE-TREE BLIGHT, <sup>Q</sup>*E. strobi*. Black, pubescent, subpruinose; a dorsal row of white meal-like spots on the tergum; fore wings with the costal margin, the apical and two inner basal nerves, black. Length, 0.20. Common on branches of the white pine, giving to the bark of infested trees a peculiar black appearance. Belongs to a nondescript genus, intermediate between this and *Lachnus*. No. 867, male; 868, female.

#### BRYSOCRYPTA. HALLIDAY.

<sup>88</sup> WITCH-HAZEL BRYSOCRYPTA, <sup>Q</sup>*B. hamamelidis*. Males black, pruinose; wings hyaline; nerves brown; legs whitish; knees and tarsi black. Larva smaller, brown. Length, 0.09. Inhabits conical follicles on the upper surface of witch-hazel leaves; each follicle contains about a dozen individuals, and has a small orifice in the under surface of the leaf. No. 869, male; 870, larva; 871, its follicle.

#### FAMILY COCCIDÆ.

Our species of this family have not as yet been investigated in their living state. The dried shield-like bodies of the dead females have been met with on several of our indigenous trees. In addition to the species so abundant upon the apple-tree, and currently regarded as the <sup>89</sup>*Coccus arborum-linearis* of Geoffroy, (specimen No. 872,) the following may serve as New York examples of this family: The Willow <sup>90</sup>*Coccus*, *\*C. salicis*, is ferruginous with obsolete black spots, has an oval nearly hemispheric form, and measures 0.20 in length, (No. 873.) The Linden *Coccus*, <sup>Q</sup>*\*C. tilia*, the largest of our <sup>91</sup>species that have been observed, is ferruginous, hemispheric, and measures 0.24, (No. 874.) Both these species have the usual slit at the posterior end, and are wrinkled transversely.

## CORRECTIONS AND NOTES TO THE PRECEDING CATALOGUE, BY E. P. VAN DUZEE.

01. Cicada tibicen *Linn. Uhler.\**
02. Tibicen rimosa (*Say*) *Uhler.*
03. Tibicen septendecim (*Linn.*) *Uhler.*
- ✓ 04. Myndus impunctatus (*Fitch.*)
05. Oliarus quinquelineatus (*Say*).
- ✓ 06. Liburnia arvensis (*Fitch.*)
- 1 07. Stenocranus dorsalis (*Fitch.*)
- ✓ 08. Ormenis pruinosa (*Say*).
- ✓ 09. Lamenia vulgaris (*Fitch.*)
10. Enchenopa binotata (*Say*).
11. Campylenchia curvata (*Fabr.*).
12. Pubilia concava (*Say*).
13. Carynota n. genus. Dr. Goding gives *Optilete Stal* as a synonym of this genus. *Membracis mera Say* must be considered its type.
14. Vanduzea arquata (*Say*).
15. Cyrtolobus inornatus (*Say*).
16. Stictcephala inermis (*Fabr.*).
17. Cyrtolobus vau (*Say*).
18. Atymna castanæ (*Fitch*).
19. Atymna quercu (*Fitch*).
20. Archasia galeata (*Fabr.*).
21. Cyrtosia n. genus. This name being preoccupied, Dr. Goding has adopted in its place Mr. Uhler's MS. name *Cyrtolobus* (see *Trans. Amer. Ent. Soc.*, xix, 1892, p. 257).
22. Carynota marmorata (*Say*).
23. Cyrtolobus fenestratus (*Fitch*)  
Type of *Cyrtosia Fitch* = *Cyrtolobus Goding*.
24. Telamona n. genus. Type, *T. fasciata Fitch*.
25. Telamona fasciata *Fitch*, female.
26. Heliria scalaris (*Fairm.*).
27. Telamona coryli *Fitch*, female, if I have rightly identified the species.
28. Telamona monticola (*Fabr.*).
29. Acutalis dorsalis (*Fitch*).
30. Microcentrus caryæ (*Fitch*).
31. Aphrophora parallela *Say*.
32. Aphrophora saratogensis (*Fitch*).
33. Clastoptera pini *Fitch* — probably correct.
34. Dicrocephala coccinea (*Forst.*).
35. Dicrocephala mollipes (*Say*).
36. Dicrocephala nova-boracensis (*Say*).
37. Helochara communis *Fitch*. Type of genus.
38. May possibly be Burmeister's *Gypsona striata*, published a few years earlier.
39. Paramesus vitellinus (*Fitch*).
40. Only the female of the next (41).
41. Jassus olitorius *Say*.
42. Chlorotettix tergatus (*Fitch*).
43. Chlorotettix unicolor (*Fitch*), type of genus *Chlorotettix VanD*.
44. Eutettix (?) seminudus (*Say*).
45. Thamnotettix clitellarius (*Say*).
46. Phlepsius strobi (*Fitch*).
47. May prove identical with *Jassus verticis Say*.
48. Bythoscopus variabilis (*Fitch*).
49. Male of *B. variabilis*.
50. Bythoscopus fenestratus (*Fitch*).
51. Bythoscopus minor (*Fitch*).
52. Doubtless a species of *Bythoscopus*.
53. Bythoscopus nigrinasi (*Fitch*).
54. Athysanus Curtisii (*Fitch*).
55. Deltocephalus Sayii (*Fitch*).
56. Deltocephalus Melsheimerii (*Fitch*).
57. Deltocephalus inimicus (*Say*).
58. Phlepsius irroratus (*Say*).
59. Phlepsius fulvidorsum (*Fitch*).
60. Platymetopius acutus (*Say*).
61. Erythroneura. Now united with *Typhlocyba Germ*.
62. Typhlocyba vulnerata (*Fitch*) *Woodw.\**
63. Typhlocyba vitis (*Harris*) *Woodw.*
64. Typhlocyba affinis (*Fitch*) *Woodw.*
65. Typhlocyba tricincta (*Fitch*) *Woodw.*
66. Typhlocyba obliqua (*Say*) *Woodw.*
67. Empoasca fabæ (*Harris*).
68. Empoa n. genus: also united with *Typhlocyba Germ*.
69. Typhlocyba querci (*Fitch*) *Woodw.*
70. Typhlocyba coccinea (*Fitch*) *Woodw.*

\* In the Cicadidæ, Mr. Uhler's list published in the *Transactions of the Maryland Academy of Sciences*, vol. i, has been followed: in the Typhlocyclidæ, that of Mr. Woodworth, in *Psyche*, vol. v.

CORRECTIONS AND NOTES BY C. V. RILEY.

- |   |   |
|---|---|
| 71. <i>Trioza tripunctata</i> (Fitch).  | 80. <i>Siphonophora rudbeckiæ</i> (Fitch).  |
| 72. <i>Psylla annulata</i> Fitch. Is probably a variety of <i>P. carpini</i> Fitch.   | 81. <i>Schizoneura ulmi</i> (Linn.).  |
| 73. <i>Myzus cerasi</i> Fabr.   | 82. <i>Chaitophorus populi</i> (Fitch).   |
| 74. "Aphis cerasicolens" Fitch. The Fitch types (4) in the U. S. N. M. are, from their condition, absolutely indistinguishable, and do not admit of comparison with <i>A. cerasifoliæ</i> to determine the validity of the species. | 83. <i>Schizoneura lanigera</i> (Hausm.).   |
| 75. <i>Rhopalosiphum berberidis</i> (Fitch).  | 84. <i>Pemphigus pyri</i> (Fitch).  |
| 76. <i>Siphonophora asclepiadis</i> (Fitch).  | 85. <i>Pemphigus tessellata</i> (Fitch).  |
| 77. <i>Callipterus betulæcolens</i> (Fitch).  | 86. <i>Schizoneura imbricator</i> (Fitch).  |
| 78. <i>Chaitophorus aceris</i> (Linn.).   | 87. <i>Lachnus strobi</i> (Fitch).  |
| 79. <i>Chaitophorus populifoliæ</i> (Fitch).  | 88. <i>Hormaphis hamamelidis</i> (Fitch).   |
|   | 89. <i>Mytilaspis pomorum</i> (Bouché).   |
|   | 90. <i>Lecanium salicis</i> (Fitch). While the "Coccus salicis" of Fitch is a <i>Lecanium</i> , there is a <i>Coccus salicis</i> of Linnæus which is a <i>Chionaspis</i> , and Bouché's <i>salicis</i> is a <i>Pulvinaria</i> . |
|   | 91. <i>Lecanium tilix</i> (Fitch).*   |

The following is a list submitted by Dr. Riley, of the Psyllidæ, Aphididæ, and Coccidæ of the Fitch catalogue given in the preceding pages, arranged in their systematic order with their present accepted family, subfamily, generic and specific names, their Fitch synonyms, and indication of types contained in the United States National Museum.

Family PSYLLIDÆ.

Subfamily Liviinæ.

*Livia* Latreille.

*Livia vernalis* Fitch. Types (4) in U. S. N. M.

*Livia femoralis* Fitch. In U. S. N. M., type lost from pin.

Subfamily Psyllinæ.

*Psylla* Geoff.

*Psylla quadrilineata* Fitch. Types in U. S. N. M.

*Psylla carpini* Fitch. Types in U. S. N. M.

*Psylla annulata* Fitch. Probably var. *carpini*.

Subfamily Triozinæ.

*Trioza* Förster.

\* *Trioza tripunctata* (Fitch). *Psylla tripunctata* Fitch. Types in U. S. N. M.

Family APHIDIDÆ.

Subfamily Aphidinæ.

*Siphonophora* Koch.

*Siphonophora asclepiadis* (Fitch). *Aphis asclepiadis* Fitch. Types in U. S. N. M.

\* There is no *tilix* Fitch in the Fitch collection, but specimens of *tilix* Linn., which Comstock believes to be *liriodendri* Cook.

Siphonophora rudbeckiæ (*Fitch*). *Aphis rudbeckiæ* Fitch.

*Rhopalosiphum* Koch.

*Rhopalosiphum* (*Fitch*). *Aphis berberidis* Fitch.

*Myzus* Pass.

*Myzus cerasi* (Fabr.). *Aphis cerasi* Fabr. Fitch.

*Aphis* Linn.

*Aphis brassicæ* Linn.

*Aphis cornifoliæ* *Fitch*. Types (nearly destroyed) in U. S. N. M.

*Aphis cratægifoliæ* *Fitch*. Types (nearly destroyed) in U. S. N. M.

*Aphis cerasicolens* *Fitch*.

*Aphis mali* Fabr.

*Aphis malifoliæ* *Fitch*.

*Aphis pinicolens* *Fitch*. Type (without abdomen) in U. S. N. M.

*Aphis sambucifoliæ* *Fitch*. Type in U. S. N. M.

#### Subfamily Callipterinae.

*Chaitophorus* Koch.

*Chaitophorus aceris* (*Linn.*). *Aphis aceris* Linn. Fitch.

*Chaitophorus populifoliæ* (*Fitch*). *Aphis populifoliæ* Fitch.

*Chaitophorus populi* (*Linn.*). *Lachnus populi* Linn. Fitch.

*Callipterus* Koch.

*Callipterus betulæcolens* (*Fitch*). *Aphis betulæcolens* Fitch.

#### Subfamily Lachninae.

*Lachnus* Illiger.

*Lachnus abietis* *Fitch*. Types (nearly destroyed) in U. S. N. M.

*Lachnus alnifoliæ* *Fitch*. Types (nearly destroyed) in U. S. N. M.

*Lachnus quercifoliæ* *Fitch*. Types (nearly destroyed) in U. S. N. M.

*Lachnus salicellis* *Fitch*.

*Lachnus strobi* (*Fitch*). *Eriosoma strobi* Fitch. Types in U. S. N. M.

#### Subfamily Schizoneurinae.

*Schizoneura* Hartig.

*Schizoneura imbricator* (*Fitch*). *Eriosoma imbricator* Fitch.

*Schizoneura ulmi* (*Linn.*). *Lachnus ulmi* Linn. Fitch. Specimens in U. S. N. M.

*Schizoneura lanigera* (*Hausm.*). *Aphis lanigera* Hausm.

*Hormaphis* O. S.

*Hormaphis hamamelidis* (*Fitch*). *Brysocripta hamamelidis* Fitch. Type in U. S. N. M.

Subfamily Pemphiginae.

*Pemphigus pyri* (Fitch). *Eriosoma pyri* Fitch. Type in U. S. N. M.  
*Pemphigus tessellata* (Fitch). *Eriosoma tessellata* Fitch. Type in  
U. S. N. M.

Family COCCIDÆ.

*Mytilaspis pomorum* (Bouché). *Coccus arborum-linearis* Geoffroy.  
Fitch.

*Lecanium salicis* (Fitch). *Coccus salicis* Fitch. Type in U. S. N. M.

*Lecanium tilia* (Fitch). *Coccus tilia* Fitch.

(B)  
ENTOMOLOGICAL ADDRESSES.

REPORT OF THE COMMITTEE ON ENTOMOLOGY.

[Read before the Western New York Horticultural Society at its Annual Meeting, January 29th, 1891.]

The Committee on Entomology beg leave respectfully to report:

It is gratifying to be able to report not only continued, but a marked accelerated progress in this department during the past year. It is safe to say that greater attention has been given to insects than in any preceding year. Large collections have been made; many new species have been described; life-histories have been worked out; experimentation in methods of controlling injurious species has been earnest, extended, and successful; and publication of these labors and results has been placed in the hands of the student and the agriculturist. As illustrating the growing interest manifested in this branch of study, we may state that, while in former years, far more attention had been given to plants than to insects, a recent report of Director Atwater, of the Office of Experiment Stations, at Washington, gives as the number pursuing entomological investigations at the different stations, at that time (1890) as twenty-nine, as against thirty engaged in botanical studies. From so large a corps of earnest entomologists, generally distributed over the United States, and vying with one another to produce the best results, what may we not expect for the future of economic entomology.

Of the progress which we have mentioned, most of it has been in a practical direction,—in methods of control of insect pests. Prominent among these, and, therefore, the first to which we will refer, we will name

SPRAYING WITH INSECTICIDES.

*Effect of London purple on the plum.*—At the last annual meeting of this Society it was stated by one of the members, in discussion, that he had nearly ruined a plum orchard by spraying it with a pound of London purple in three hundred gallons of water, for, as the result of spraying, every leaf fell from the trees. In the report of the recent meeting of the Ontario Fruit Growers' Association, this statement from

the same gentlemen, is repeated in still stronger terms—"he had utterly ruined a valuable plum orchard by the use of London purple." The statement was questioned at the time when made to this society, and from what has subsequently been learned, we deem it proper to say that there is hardly a remote probability that the injury to the trees, causing the falling of the foliage, which followed the spraying, can be in the least ascribable to the spraying, but was solely owing to a fungus attack of the leaves.

In recent experiments by Professor Bailey, of Cornell University, conducted in the most careful manner, plum trees sprayed with one pound of London purple to *two hundred gallons* of water, were not injured in the slightest degree. Although not so stated, it may be inferred that the ordinary coarse spray was used—not the fine one, which appears to be much more safe on delicate foliage.

Experiments reported by Prof Gillette of the Iowa Agricultural Experiment Station, show slightly differing results from the above, as the same mixture gave a seven per cent injury to plum foliage. The application, in this instance, was with the Woodason bellows-sprayer or atomizer. (*Bull. No. 10, Iowa Agr. Exp. Station, August, 1890.*)

*London purple on the peach.*—The spraying experiments of Professor Bailey have confirmed observations previously made by others, that the foliage of the peach is more susceptible to injury from London purple than other of the fruits. While it sustained no harm from one pound of Paris green in two hundred and fifty-six gallons of water, one of London purple four to hundred, caused slight injury. It is probable that one to four hundred and fifty, applied in a fine mist-like spray, could be used with entire safety; but as it is quite doubtful if this degree of reduction would kill the curculio, it is advisable that Paris green only, of the arsenites, should be employed on the peach unless other substances are combined with them.

*Solubility of London purple.*—The greater liability to injury from London purple is owing to its greater solubility in water. According to Professor Bailey—"the arsenic in London purple is in the form of a normal arsenite of calcium, which substance comprises about seventy-two per cent of the whole compound; and over fifty per cent (52.38) of it, or *nearly forty per cent of the London purple is quickly soluble in water.* (*Bulletin No. 18 of the Cornell University Agricultural Experiment Station, July, 1890.*)

*An efficient nozzle for low spraying.*—Mention is made and illustration given, in the Bulletin from which we have quoted, of a bush nozzle devised by Prof. Bailey, for use on low bushes, when the insects, like the currant worm, feed largely on the underside of the leaves. The

discharge from it may be graduated to any desirable degree by mechanism which admits of a speedy and definite compression of the end of a rubber discharging tube. A single spraying early in the season with this nozzle and Paris green water kept the currant bushes free from the larvæ for nearly the entire season, which was one of unusual abundance of the worms.

*Addition of lime to the arsenites.*— Quite an interesting and seemingly valuable result has been obtained by Professor Gillette, in that he has found that lime added to London purple or Paris green in water, greatly lessens the injury that these poisons would otherwise do to foliage. With this addition, it seems that they may safely be used on the most tender foliage, even on the peach. On this, only one per cent of injury was observed with one pound of the purple to two hundred gallons of water, and only five per cent with one hundred gallons. The average of several experiments with the limed arsenical mixture on cherry, apple, plum, and peach, with one pound of the purple to *one hundred* gallons of water, was the trifling amount of *one per cent*. It would seem, therefore, to be a desirable spraying liquid against the curculio, in that the insect would be more surely affected by feeding on heavily poisoned leaves.

The lime was prepared by slaking it in a barrel, and stirring it afterward until the water became quite milky—up to the degree that it would not clog the nozzle of the sprayer.

*Fungicides combined with the arsenites.*— The convenience of combining fungicides with insecticides, has been for sometime recognized and regarded as a desideratum. Professor Gillette, after having experimented with several of the fungicides with a view of ascertaining their efficiency in destroying leaf-feeding insects, reports: that of all the substances which he has used, none can be compared with Bordeaux mixture for the prevention of injury to foliage. Although the statement seems hardly credible, he had been unable to produce the least harm upon plum and peach foliage (the more sensitive of the fruits) with London purple in standard Bordeaux mixture, even when used in the proportion of one pound to fifty gallons. In the proportion of one pound to twenty-five gallons, not the least injury was produced to plum foliage. As a severe test, one pound to ten gallons caused no damage to the apple. This almost perfect immunity from harm, might be owing, it was thought, to the precipitation of the soluble arsenic in the purple by the lime and copper hydrate of the Bordeaux mixture. Several other interesting conclusions in relation to various substances and compounds used in spraying, were reached, for which reference is made to the Bulletin cited.

While the Bordeaux mixture may be freely and advantageously used in combination with London purple, it should be borne in mind that the ammoniacal solutions of copper — so valuable against the apple-seab and some other of the plant diseases — should not be used with it; and especially, that these solutions are very harmful when combined with Paris green, as the ammonia acts as a solvent of the arsenite, and thereby greatly adds to the injury that it may cause. In evidence of this, see Bulletin No. 11 (page 14), of the Massachusetts Agricultural Experiment Station, January, 1891, where a report of experiments shows that carbonate of copper solution, combined with Paris green in the proportion of one pound to five hundred gallons of water very seriously injured the foliage.

*Spraying for the plum curculio.*—Experiments by Dr. C. M. Weed, of the Ohio Agricultural Experiment Station, show that plum trees sprayed four times with Paris green — one to two hundred gallons of water, gave twice the amount of protection that was obtained from jarring, while “vastly cheaper and easier of application.” It at the same time, gave protection from the plum-leaf fungus and the brown rot, that later visited the unsprayed portion of the orchard. *Bulletin (Vol. III, No. 8, September, 1890), of the Ohio Agr. Exper. Station.*

*Spraying for the codling-moth.*—The following results were obtained by M. H. Beckwith, of the Delaware Agricultural Experiment Station (*Bulletin No. 8, March, 1890*): 1. Trees sprayed with Paris green (1 to 150, too strong, and 1 to 200) gave four times as large a yield as did the unsprayed. 2. The average yield of sound apples from the sprayed, was nine times as great as from the unsprayed. 3. Of the sound apples gathered from the sprayed trees, ninety per cent had been saved by the spraying. 4. The sound apples from the former were much superior in quality to those from the latter.

*A new insecticide machine.*—Dr. Riley, in his Presidential Address before the Association of Economic Entomologists, at Champaign, Ill., has noticed, with commendation, a new and distinct type of insecticide apparatus — the invention of Mr. Strawson, of Newbury, Berks, England. We quote, as follows: “The machine is called the ‘Strawsonizer,’ and is a pneumatic or air-blast distributor, and may be adapted to a variety of uses, such as broadcast sowing of grains, distribution of fertilizers or of disinfectants in cities, and of dry or liquid insecticides. The machine is light, simple in construction, and easily operated by one man, the larger sizes being drawn by a horse, and the smaller by hand power. The distributing power is obtained by a blast of air produced by a revolving fan worked by the traveling wheels of the machine.

“Very uniform and rapid work may be done with this machine in broadcast sowing of wheat, oats, and smaller seeds. These are distributed with great regularity over a track eighteen to twenty feet wide, giving a rate of thirty to forty acres per day. It is especially serviceable as a distributor of fertilizers (phosphates, nitrate of soda, lime, etc.,) and all insecticide powders, which latter may frequently be applied in connection with the former substances.

“Liquid insecticides are distributed broadcast at the rate of from one gallon upwards per acre, and by the action of the powerful blast of air are broken up into a fine mist, which spreads uniformly to a width of twenty feet.”

“The one-horse power machine for broadcasting grains, fertilizers, and other solid or liquid insecticides, with suitable receptacles and nozzles, is retailed in England for £30 sterling, or \$150. Hand-power machines are sold for £12 and £14.”—*Insect Life*, iii, 1891, pp. 194, 195.

*Insecticides lately recommended.*—Prof. J. B. Smith, of the New Jersey Experiment Station has recently written of the value of potash salts for insecticidal purposes. High testimony to their value is given. Kainit was found to be more effective than the muriate of potash. Used of a strength of a half-pound to a gallon of water, it was effective against cabbage maggots, plant-lice infesting rose-bushes, and other species. Muriate of potash of the same strength quickly killed the mealy bugs on green-house camellias when sprayed upon them, without injury to the plants. It was also promptly effective upon the rose-leaf roller, *Cacœcia rosaceana*. It was found to injure some of the more delicate plants, and therefore needs further experiment with it.

Of the several preparations of tobacco, Prof. Smith gives preference to that known as “X. O. Dust,” which seems to be tobacco, carbolic acid, and whiting. It was more active against plant-lice than even pyrethrum, and all kinds of naked larvæ yielded readily to it. The cabbage-worm was destroyed by it.

Prof. Smith also gives high attestation to the value of Sludge-oil soap, manufactured by the Columbia Chemical Works, Brooklyn, N. Y. It was tried upon the rose-bug, *Macroductylus subspinosus*, against which, when appearing in full force as it often does in New Jersey, everything else had failed. This was the only material that would conquer these insects, in the experience of Prof. Smith. Col. Pearson of Vineland, who has so long been experimenting with methods for controlling the rose-bug, also had most gratifying success in the use of this insecticide. The experiments made with this soap were necessarily limited, and it is to be hoped that they will be continued.

## NOTES ON SOME GARDEN AND ORCHARD INSECTS.

It may be of interest to refer to a few observations and experiments made during the year upon insects of importance to the horticulturist.

*Protection from the striped cucumber beetle.*—Dr. Weed's experiments indicate that the most promising insecticide for preventing the ravages of this insect, is tobacco powder, applied in liberal quantities to the plants. A shovel full may be used to a hill, as it acts both as a mulch and a fertilizer. In some factories the dust is given away as a refuse material. (*Bull. Ohio Agricul. Exper. St.*, iii, No. 8, September, 1890.)

*The apple curculio.*—The oviposition of the apple curculio, *Anthonomus quadrigibbus* Say, has been described and illustrated, by Prof. Gillette, in *Bulletin No. 11 of the Iowa Agricultural Experiment Station*, for November, 1890. This insect, so destructive in some of the Western States, is not very injurious within the State of New York.

*The pear-blight beetle.*—The little wood-boring beetle, noticed in the Proceedings of this Society at its Annual Meeting in 1890, under the name of the pear-blight beetle, or *Xyleborus pyri* (Peck), as having nearly destroyed a young pear orchard in Lockport, N. Y., has been found to be identical with the European species long known as *Xyleborus dispar* (Fabr.). The American name which has been recognized by us for so many years, will therefore have to give place to the older Fabrician one. This insect was probably introduced into this country from Europe toward the latter part of the last century. Since its destructive appearance at Lockport, as narrated, it has not been observed in that locality. The nature of the peculiar larval food, lining the chambers as a thick white coating, has not yet been satisfactorily determined.

*The rose-bug.*—The announcement made in the same paper above cited, that the Entomological Division at Washington had succeeded in working out the life-history of the rose-bug and would soon publish it, was premature. Dr. Riley, in *Insect Life*, for April, 1890 (ii, pp. 295-302), has given an excellent paper on this insect, illustrating the larva, pupa, and imago, and containing its past history, the little that is known of its natural history, its geographical distribution, interesting remarks on its food-plants and ravages, the enemies that prey upon it, which are few in number and include no true parasites, and remedies resorted to against it. Its full life-history is yet a desideratum. In *Insect Life*, for January, 1891 (iii, No. 5), Prof. J. B. Smith has presented a graphic account of an "Experience with the Rose-bug," the preceding season, in Vineland, N. J., during an invasion not at all

uncommon there, but such as we are never called to contend with in the State of New York. He "had never seen insects in such numbers, in such constantly increasing swarms and of such enormous industry. \* \* It was simply awful! Every cherry was cleared off. Apple trees presented a great mass of sprawling rose-bugs burdening each apple. The fruit itself was not visible, but its situation was marked by the clumps of beetles. Nothing escaped them except peaches, and they, only, because there were none anyway. Pears were infested as badly as apples. Of the small fruits the blackberry seemed very attractive. \* \* \* Raspberries were entirely destroyed. \* \* \* They were in such force in Colonel Pearson's strawberry patches that the field looked like a yellow mass of moving insects. Millions of them swarmed on a couple of sour-gum trees on the road. In the vineyard, the havoc was woeful. Dozens of them were on each bunch of blossoms, and their fate was sealed. There were not blossoms enough to go round. On Clintons, they ate the entire leaf. \* \* \* The contemplation of such enormous swarms induced a feeling of helplessness that was discouraging."

Colonel Pearson had used the usual copper compounds and found none of them effective. Vines completely coated with the Bordeaux mixture were as badly attacked as were those where none was applied. London purple had been used, and while it had killed some of the insects, "it was not protective at all, since all the buds and blossoms were eaten before the poison began to work."

Experiments made by Prof. Smith gave the following results: carbolated lime served no purpose as a repellent; fresh air-slaked lime dusted on the leaves, was ineffective, and applied in liquid to the extent of whitening the foliage, gave no better results; powdered naphthaline mixed with carbonate of lime, although strongly odorous, had no effect; tobacco powder and the X. O. Dust, seemed to serve as a relish and an appetizer; a strong solution of tobacco applied until the leaves were coated, gave the same effects; pyrethrum powder, which has been recommended by the *Rural New Yorker* as an infallible remedy, failed entirely to keep away or to kill the insects, or arrest the ravages, although used of the strength of one-fourth of a pound to a gallon of water, and of a quality warranted pure and perfectly fresh, for which \$2 per pound was paid; a strong decoction of quassia was not in the least distasteful to them; acetate of copper, digitalis, and acetic acid, were each barren of any good result; even kerosene emulsion, while it drove them away temporarily, did not prevent their return. At this time, toward the close of the campaign, sludge-oil soap was applied, with the result already stated.

*The Marquerte fly.*—This destructive miner of the leaves of the Chrysanthemums, Cinerarias, Eupatoriums, and other Compositæ, which has been so injurious in portions of New York and Massachusetts, was treated of at some length in the *Fourth Report on the Insects of New York*, under the scientific name of *Phytomyza lateralis* (Fallen), it having been identified by Baron Osten Sacken, of Germany, to whom it had been submitted, as identical with the European species of that name. It has subsequently been found that the identification was an erroneous one, and it has accordingly since been named and carefully described as *Phytomyza chrysanth-mi* Kowarz, as will appear in the *Seventh Report on the Insects of New York*.

*The bean weevil.*—The report last-named will contain an extended article on this pernicious insect, based on studies made during the past year, in which it is shown that the insect may continue to breed indefinitely within the same lot of beans, although old and dried, for as long a time as the food-supply may last.

#### CONCLUSION.

It was purposed to extend materially the above insect notes, through examination of the literature of the year, and also, to cite some of the publications, especially, Bulletins of the Experiment Stations containing matters of especial interest to horticulturists; but this has been prevented by other engagements and duties that have intruded into the time allotted to this paper.

And further: the "Report of the Committee on Entomology" might properly be expected to contain mention of the several insect attacks — their character, extent, etc., which have occurred during the past year within the sphere of the Society's operations. That such is not found herein, is chargeable to the fact, that this paper can only be offered as the report of the chairman of the committee — it having been prepared without the opportunity of conference with his associates, or even its submittal for their approval and acceptance. Request for their aid was necessarily delayed, until, doubtless, too late for the preparation of the information asked for, and its communication.

Respectfully submitted,

J. A. LINTNER,

*Chairman.*

## REPORT OF THE COMMITTEE ON ENTOMOLOGY.

[Read before the Western New York Horticultural Society at its Annual Meeting, January 26th, 1893.]

In grateful recognition of the TRIBUTE paid by this society to the science of economic entomology, in giving place in its annual convocations, amid so many papers of a high order of excellence, and discussions replete with interest and instruction, to a "Report on Entomology" your committee takes pleasure in presenting the following report:

[Remarks on the remarkable exemption during the past year from insect injuries and its probable causes, with reference to several species, are given on pages 293, 294 of this Report.]

### VARIOUS PESTS OF THE YEAR.

Among the insect demonstrations of the year, the following may deserve a few words of notice at the present time.

[Notice of several of these demonstrations, as of the fall tent-worm, *Hyphantria cunea*; the green-striped maple worm, *Dryocampa rubicunda*; the cabbage caterpillar, *Plusia brassicae*; the canker-worm, *Anisopteryx vernata*; the apple-worm of the codling-moth, *Carpocapsa pomonella*; the white grub, *Lachnosterna fusca*; the elm-leaf beetle, *Galerucella xanthomelana*; a gooseberry pest, *Systema frontalis*; the Colorado potato-beetle, *Doryphora decemlineata*; the plum curculio, *Conotrachelus nemphar*; and a house-infesting beetle, *Otiiorhynchus ovatus*, are contained in GENERAL NOTES FOR THE YEAR on pages 295, 296, and 297 of this report and are therefore omitted here.]

Passing from these general notes, may I ask your attention to a more detailed notice of three insect enemies of fruit and forest and shade trees, which are, at the present, subjects of special study, in the hope of discovery of means by which their serious ravages may be arrested.

### THE GYPSY MOTH.

Notwithstanding the many insect pests of the first rank that are preying upon and devouring the products of the orchards, vineyards, nurseries, gardens, fields, and forests of the State of New York, it is a cause of thankfulness that another insect pest which the people of an adjoining State have been for the past two years, under liberal State

aid, endeavoring to exterminate, has not yet entered within our borders. I refer to the Gypsy Moth, *Oenieria dispar* (Linn.), which was accidentally introduced into Massachusetts about the year 1869, by a gentleman interested in the rearing of silk-worms.

When first brought to notice in 1889 by Professor Fernald, of the Massachusetts State Agricultural College, as a dangerous public enemy, it was believed to be confined to a single locality in the town of Medford, less than a square mile in area. It had at that time, according to Professor Fernald, "multiplied to such an extent as to cause the entire destruction of the fruit crop and also to defoliate the shade trees in the infested region." The imperative necessity of its arrest, and the probability that it might be exterminated if proper means were promptly brought to bear upon it, urged by Professor Fernald, led to an appropriation by the Massachusetts State legislature, in March, 1890, of \$25,000, for the accomplishment of the desired end, and the appointment by the Governor of three commissioners to conduct the work. An additional appropriation of an equal amount was made later in the year.

The commissioners, in entering upon their labors, found that the moth, instead of being confined to the narrow limits above named, had already invaded various parts of a territory four miles long by sixteen broad. Active measures were carried on by the commissioners during the season of 1890, yet, at its close, they reported the insect in seven different towns over an area of fifty square miles. Many acres of brush had been burned over, and 70,000 trees had been sprayed with Paris green and water, in which about two tons of the Paris green were used.\*

The following year, in lieu of the commissioners, the work was placed in the hands of the State Board of Agriculture, and by them intrusted to a Gypsy Moth Committee of three carefully selected persons. The magnitude of the work becoming apparent, another appropriation was made by the legislature in June of 1891, of \$50,000—making the aggregate of appropriations thus far, \$100,000.

It appears, from a special report on the subject recently made by the State Board of Agriculture, that their committee have conducted their work during the past year (*i. e.*, in 1891), with energy, with judgment, and with all the success that could have been expected. Some of the measures used by them for the control of the insect, were the following: spraying trees with Paris green in water; spraying the caterpillars with insecticides that kill by contact; spraying infested stone walls with kerosene and firing it; gathering the egg-clusters and burning

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\*Up to the present time, three and a half tons of Paris green has been used.

them; banding the trees with tarred paper to prevent the ascent of the caterpillars, and with burlaps for a hiding-place where they could easily be destroyed; burning brush and infested shrubbery after kerosening it; burning out nests in holes of trees and cementing; inspecting all vehicles going out of the infested territory for the caterpillar.

The extent of the work done will more fully appear from the following statement published by the committee, covering operations from April 1, 1891, to December 31, 1891:

|                                  |           |
|----------------------------------|-----------|
| Trees: Number inspected .....    | 3,591,981 |
| Number infested .....            | 213,828   |
| Number cleaned of eggs.....      | 212,423   |
| Number sprayed.....              | 177,415   |
| Number cemented.....             | 19,296    |
| Number burlapped.....            | 68,720    |
| Number banded.....               | 12,000    |
| Buildings: Number inspected..... | 87,536    |
| Number infested.....             | 3,647     |
| Number cleaned of eggs.....      | 3,574     |

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What is regarded as a conservative estimate, based on the daily reports made to the committee, shows the aggregate number of egg-clusters destroyed during the first six weeks of the season, to be 757,760. Their bulk, according to Director Forbush, was nearly eight cart loads. The average number of eggs in a cluster being 468, there were over 353 millions of eggs destroyed during that time. The largest number of men employed at any one time was 242.

At the close of the year 1891, covered by the report referred to, the insect was known in twenty-six towns in Massachusetts, over an area of 200 square miles. No instance of its occurrence outside of the State of Massachusetts had been authenticated.

Through the kindness of Prof. Forbush, director of the field-work of the Gypsy-moth Committee, in sending me for use on this occasion a typewritten copy of his address before the State Board of Agriculture, in December last, I am able to make extracts therefrom relating to the operations of last year (1892).

The appropriation made by the Legislature to the State Board of Agriculture for the prosecution of the work in 1892 was \$75,000. Operations were conducted much in the same manner as in the preceding year, but after thoroughly testing the principal means of control employed in this country and in Europe for this and similar insects, they proved

to be inadequate, and new measures were experimented with, and employed when their value became established.

Thus it was found that arsenical spraying, on which much dependence had been placed, failed to kill the larger and more vigorous larvæ. Insecticides that kill by contact were therefore resorted to. The eggs were killed by an oil not previously used to any extent for insect destruction; and four tons of "insect lime," known as "raupenleim" in Germany, was imported from Europe and applied in bands on the bark around the tree: its viscosity — lasting for two months — served an admirable purpose in catching and holding all insects and effectually preventing their ascent of the tree.

The banding with burlaps was not only successful in entrapping large numbers of the *Ocneria* caterpillars, but also hosts of other injurious species, which could then be conveniently destroyed.

Gratifying success is reported from spraying infested brush and shrubbery on waste lands with kerosene from a cyclone nozzle and then igniting it. The same method, it was thought, might be effective against the marches and invasions of the army-worm.

It is claimed by the committee that they have succeeded the past year in staying the spread of the insect, and in greatly reducing its numbers. Fifty towns were thoroughly searched, and the moth found in thirty. In some of the towns it has been locally exterminated, and in three entirely destroyed. Not one egg-cluster can now be found as against a hundred in 1891. If sufficient means are provided for the work, extermination of the insect within a few years is regarded as next to certain. With an annual appropriation of \$50,000, it is confidently believed by the committee that further spread can be prevented and the insect steadily reduced in numbers.

From my present knowledge of the work of the committee, I must commend it heartily, and would further express the desire that such appropriations shall continue to be made by the State as will enable the committee so to reduce the number of the insect that it may soon be handed over to its parasites, predaceous insects, and birds for complete extermination.

If I have seemed to you to have dwelt too long upon a single insect pest, please bear in mind the deep interest which we in New York must feel in the efforts being made for the extermination of this omnivorous insect before it shall have entered within our borders. In this interest, each one of the other States should also share. And then again, if success shall, as we hope, attend this effort, it can not fail of furnishing a precedent for calling for State aid and possibly upon the National

Government, from time to time, for prevention of the spread of some other newly introduced noxious pest, by stamping it out at its place of introduction — quite as much within their province as is protection from an invading army of soldiery, or from the fearful pestilence. How insignificant were the losses inflicted by the Hessian soldiers, compared to those which have resulted from the bringing hither of the Hessian fly.

#### A DESTRUCTIVE SHADE TREE PEST.

A destructive borer of some of our most highly prized shade trees, as the elm and maple, has within the last five years been brought to notice in northern New Jersey, and in New York city and its immediate vicinity.

It is the larva of a rather large Bombycid moth, bearing the name of *Zeuzera pyrina* (Fabr.), closely allied in its habits and character to our long-known borer of the locust, oak, and willow — *Cossus robinia*. In Europe it has long been known as *Zeuzera asendi* (Linn.) — the specific name referring to the horse-chestnut on which it was probably first observed, although, according to Kollar, “choosing that tree for its abode less frequently, in the neighborhood of Vienna, than any of the other trees that serve it for food, living chiefly in elms, walnut, pear, and apple trees.”

The first example of it, so far as known, taken in this country (it is another of our introduced European pests), was found in a spider's web at Hoboken, N. J., in June, 1881 (*Papilio*, ii, 1882, p. 34).

Several examples of it were captured by collectors at electric lights in the summer of 1887, at Newark, N. J. The following year nearly fifty specimens were taken at Newark, also at electric lights. In 1889, it was found at Arlington and at Orange in New Jersey, and also, according to Mr. Pike (*Insect Life*, iv. p. 318), in Brooklyn, N. Y., where it had attacked “nearly all the trees, mostly maples, from Carlton avenue to the entrance of Prospect Park.” In June of 1890, it was reported as girdling and boring young maple trees within a few inches of the ground, at Riverside Park, New York, causing them to break and blow over with the wind; it had also attacked the elms and maples in Prospect Park, Brooklyn, and along the whole length of the eastern boulevard. The following year (1891) it had so multiplied in New York city, that, according to Mr. Southwick, the entomologist of Central Park, more than twenty species of trees and shrubs had been attacked by it, and even vines, as *Wistaria*, had not escaped its polyphagous habit: thus far, evergreens and other strongly odorous trees, as *sassafras* and *ailanthus*, seemed to be exempt from its ravages. Two men were constantly employed during the month of May in collecting

and destroying the larvæ that are taken out of the limbs that had broken off as the result of their burrowing. After every high wind, wagon loads of branches were gathered from the ground and burned. It was being combatted by every possible means, not only by burning the falling limbs, but by removing from the trees those that from their changing color or withering gave indications of infestation, and also, in case of the rarer trees, searching for an opening to burrows and injecting therein the powerful insecticide, bisulphide of carbon.

The same year it had extended its operations all over the city of Brooklyn — not an avenue or street therein but gave abundant evidence of its presence. It had also spread, according to Mr. Pike (*loc. cit.*), to Astoria, New Rochelle, Jamaica, New Lots, and Flatbush, on Long Island.

The injuries caused by this borer are quite serious. In young maples it attacks the trunk near the ground, as already stated, and so weakens it with its large burrows running around the tree as to cause it to break with the wind and fall to the ground. In the elms, different species of which it attacks, its operations, so far as observed, are confined to the limbs and branches, which are so weakened by the burrows of often a half-inch or more in breadth that they fall from their own weight or even with a moderate wind — the branches thus broken ranging from a half-inch in diameter to more than five inches.

Already many of the larger elms in Central Park have had their symmetry and natural beauty greatly impaired through this *Zenzera* attack. We are not told that any have been killed, but such a result might follow should the insect become sufficiently numerous to invade the entire tree.

We do not know that any better methods can be used to arrest this increase than those that are employed at the present at Central Park, unless some means may be devised for destroying the eggs of the moth before the hatching of the larvæ and their entrance into the tree.

#### AN ELM TREE BARK-BORER.

The preceding attack, as yet, is quite local in our State yet destined, we fear, not long to continue so. Throughout the entire State, and beyond its limits, the beautiful white elm, *Ulmus Americana*, which has been so liberally planted and so highly prized as our most valuable shade tree, is suffering from the ravages of a hidden and insidious enemy, and dying one by one from a cause, not apparent, and known to but a few. This is chargeable to the operations of one of our longicorn beetles, named *Saperda tridentata* Olivier, the larvæ or grubs of which work in the inner bark and sap-wood of the trunk — the attack

apparently commencing not far above the ground and gradually extending upward. When the grubs are numerous, their broad, flat burrows so reticulate and run into one another as effectually to girdle trunks of two to three feet in diameter, when, with the circulation arrested, the death of the tree inevitably follows. No effective remedy against this attack has as yet been found. It is probable, however, that where it has not proceeded too far, protection may be attained in coating the bark with some thick repellent substance (of which carbolic acid and Paris green should be components) that would repel egg-deposit or prevent the passage through of the newly-hatched larva. This coating would not need to be applied to the entire trunk, but might be limited to a broad zone of several feet, at and beyond that part where the burrows of the preceding year were mainly run — to be found by removing portions of the bark, which will readily scale off from the deserted older-infested portions.

A still better remedy, I think, would be the following: Remove the outer bark from the entire infested portion of the tree in the spring (occupied at the time by the larvæ or the pupæ) by shaving it down to the inner bark until the first indications of the fresh burrows are disclosed. A kerosene emulsion of good strength brushed over the shaven surface would kill the insects, after which a coating of some thick substance, as lime and cow-dung, should be applied to prevent the splitting of the sap-wood from exposure to the sun, drying winds or extreme weather.

That the barking of elms to even a greater extent than the above may safely be resorted to, appears from experiments made in France by M. Roberts, detailed in the *Gardeners' Chronicle and Agricultural Gazette* for April 29th, 1848, and quoted by Dr. Packard in his recent report on "Insects Injurious to Forest and Shade Trees" (1890), as follows:

"The whole of the outer bark was removed from the elm (this may be done conveniently by a scraping-knife shaped like a spoke-shave). This operation caused a great flow of sap in the inner lining of the bark (the liber) and the grubs of the *Scolytus* beetle were found in almost all cases to perish shortly after. The treatment was applied on a large scale, and the barked trees were found, after examination by the commissioners at two different periods, to be in more vigorous health than the neighboring ones of which the bark was untouched. More than two thousand elms were thus treated."

M. Robert has also obtained good results from cutting out strips of the bark of old elms of about two inches wide from the boughs down to the ground. "It was found that where the young bark pressed for-

ward to heal the wound and a vigorous flow of sap took place, many of the larvæ near it were killed, the bark that had not entirely been undermined was consolidated, and the health of the tree improved."

For a long period of years the elm has been remarkably free from insect attack, but now it is struggling for existence against four insect destroyers, so pernicious in their operations that we are almost compelled to look upon it as a doomed tree. The *Zeuzera* is robbing it of its beautifully branching top; the elm-leaf beetle is defoliating it and rendering it in midsummer useless for shade; the caterpillars of the white-marked tussock-moth (*Orgyia leucostigma*) are skeletonizing its leaves and arresting terminal growth by amputating the ends of the twigs and strewing them over the ground; and lastly, the three-toothed *Saperda*—the most dangerous of all—is running its mines through sapwood and liber so closely and tortuously that the death of the tree is the inevitable result.

It is sincerely to be hoped that should the suggestions above made for staying the ravages of the last named insect not prove to be practicable, other means may be found, so efficient and so simple as to lead to their general use by individuals and by city authorities; and that the steady progress northward and westward over the State of the two other elm destroyers—the *Zeuzera* borer and the elm-leaf beetle—may be stayed, and the most beautiful and serviceable of our shade trees be spared to us and to coming generations.

#### EXPERIMENT STATION PUBLICATIONS.

The work of the Experiment Stations during the past year has developed results which are of considerable value to the members of this society. I will briefly refer to a few of the studies, citing the bulletins where they are more fully detailed, in order that those who so desire may make application for them to the several stations, and procure copies before the editions shall be exhausted.

*The Pear Tree Psylla*.—Mention has been made of the remarkable cessation of the injuries during the past year of the pear-tree *Psylla* in the Hudson river valley. This insect is not confined to the eastern part of the State of New York and portions of the Eastern States adjoining, but it also occurs in Central and Western New York,—not as yet in great abundance, but the pear orchards are at any time liable to an outbreak of it.

A careful study of the insect has been made at Cornell University by Mr. M. V. Slingerland, and its results published in an illustrated bulletin of 28 pages, being Bulletin 44, October, 1892, of the University Agri-

cultural Experiment Station. Its life-history has been worked out, and the remedies available for its destruction are given. Of the various remedies experimented with, the most efficient was found to be kerosene emulsion sprayed upon the insect while in its larval stage before acquiring wings. A single spraying with the standard emulsion reduced with twenty-five parts of water (less than three per cent of kerosene) killed, as estimated, from 75 to 90 per cent of the larvæ. The early spring, just after the leaves had expanded, proved to be the best time for spraying. In the experiments made, the unexpected result was obtained that the fully exposed eggs of the *Psylla* were not to be killed by spraying with undiluted kerosene, or even when they were immersed in the liquid.

*Insects Injurious to the Blackberry.*—In Bulletin N. of the New Jersey Agricultural Experiment Station, November 30, 1891, Dr. J. B. Smith, entomologist, has given popular descriptions, accompanied with illustrations, of the more destructive blackberry insects, with suggestions regarding the remedies to be used against them.

*Insects Injurious to Young Fruit Trees.*—The entomologist of the Oregon Agricultural Experiment Station, in Bulletin No. 18, for March, 1892, has given popular accounts of, with suggestions as to remedies for, a large number of the insect enemies of young fruit trees.

*The Grapevine Leaf Hopper.*—Mr. Townsend, the entomologist of the New Mexico Agricultural Experiment Station in writing of this insect *Typhlocyba vitis* (Harris), often referred to as "the thrips," states: For some time after the hatching of the eggs, the minute young are to be found mostly on the lower, older leaves. Kerosene emulsion has been conclusively proven as the only practical remedy for them. It should be diluted with fifteen times its volume of cold water and applied *as soon as the young hoppers appear*, thoroughly reaching with the spray the underside of all the leaves, especially the lower ones. If deferred until they have acquired wings, it would be too late to attempt to destroy them in this manner. Vineyards sprayed only once the past season with the emulsion as above directed, showed thereafter not enough hoppers to do any injury for the remainder of the season, the same vines having been very plentifully infested before the application. (Bulletin No. 5, March, 1892, New Mexico Agr. Exp. Station.)

It is strange, when this insect can be so easily destroyed, that there should appear every year in the *Vineyardist* and other papers, so many complaints of severe injuries sustained from it.

*The Strawberry Weevil.*—Mr. M. H. Beckwith, of the Delaware Agricultural Experiment Station, in Bulletin No. 18, for September,

1892, has written of this weevil, *Anthonomus musculus*, which works in the buds and blossoms of the perfect flowering varieties, its larvæ penetrating the center of the blossom (the ovary or the rudimentary berry) and thereby blasting the berry. Kerosene emulsion and powdered hellebore in water are recommended for use against it.\*

*A New Strawberry Slug.*—Prof. Herbert Osborn, of the Iowa Experiment Station, reports successful experiments in killing the green strawberry-slug, *Monostegia ignota* (Norton), which in the early part of June had extensively eaten the leaves of a strawberry patch on the Station grounds. They were thoroughly sprayed with one pound of London purple to 200 gallons of water. The fruit was partly grown at the time. Further injury ceased within two or three days, and the slugs were killed, as shown by the presence of their dead bodies. Two and one-half gallons of the spray, containing about forty grains of arsenic, had been applied to a patch of nearly one square rod. Estimating that the fruit—about six quarts—had received one-tenth of the spray distributed (four grains) and that one-half of the amount of the spray would have been equally effectual, and accepting two grains of arsenic as a dangerous dose, it appears from these data that upwards of twelve quarts of the ripe fruit would have to be eaten to give a fatal dose of the arsenic (Bulletin No. 18, Iowa Agricultural Experiment Station, August, 1892).

*Protection from the Cabbage Maggot.*—In the Eighth Annual Report of the Wisconsin Agricultural Experiment Station for the year 1891, Professor E. S. Goff has presented very successful results in protecting cabbage and cauliflower plants from the attack of the cabbage-fly, *Anthomyia brassicæ* Bouché, by surrounding the stalk of the plants at their setting, with small hexagonal discs of tarred paper, rapidly cut from sheets by means of a tool devised for the purpose. It seems to be the most successful method yet discovered for protection against this most annoying pest of truck-farmers and gardeners, which often destroys entire crops of early cabbages and cauliflowers. For details of the method, the report cited may be referred to, or an article contributed by me to the issue of *Gardening* for February 1, 1893.

*Kerosene for the Aphis.*—Professor Goff has also experimented with kerosene emulsions for destroying the eggs of the aphis infesting apple and plum (*Aphis mali* Fabr.) during the winter while there were no leaves to interfere with the distribution of the insecticide. The experiments were not successful, for although emulsions of the strength of twenty, twenty-five, and thirty per cent were used, it was

\* This insect has recently been shown to be the *Anthonomus signatus* of Say. See *Insect Life* v, January, 1893, pp. 167-196, for an extended account of it, with illustrations, by Mr. F. H. Chittenden.

subsequently found that the sprayings had failed to destroy the eggs. Full success, however, was attained by a spraying of emulsion containing thirteen per cent of kerosene, on April 24th, just as the buds of the apple were beginning to burst. The aphides were hatching from the eggs at this time, and they were almost entirely destroyed. This, therefore, may be accepted as the most vulnerable period in the life of the insect. (See the report above cited.)

*Soapsuds for the Cabbage Aphis.*—Kerosene emulsion has been recommended for killing the plant-lice that often congregate in immense numbers on the leaves of cabbage, but if the emulsion is used of the proper strength to kill the insect, it also imparts a permanent flavor of kerosene to the plant. In trials made at the South Dakota Station of various insecticides, strong soapsuds gave better satisfaction than any other remedy and proved highly efficacious. While most fluid applications were found to roll off from the aphides without wetting them, the soap solution readily penetrated the gray powdery substance which covers their body and killed them. (South Dakota Agricultural Experiment Station, Bulletin No. 30, March, 1892.)

*Plant-lice and Red Spiders on Rose bushes.*—Professor C. H. Fernald, of the Hatch [Massachusetts] Agricultural Experiment Station, reports that potted rosebushes of different varieties, every twig of which was literally covered with the aphides, and more or less the surface of the leaves, and also having the red spider, *Tetranychus telarius* (Linn.) exceedingly numerous on the leaves, were inserted and held for about a quarter of a minute in a pailful of kerosene emulsion, with this result: two days thereafter, examination of the bushes failed to show either a single living plant-louse or red spider; and none appeared on them for the rest of the season.

#### SPRAYING AND INSECTICIDES.

A few notes on what is being done in spraying for insect pests, and on some new insecticides, may not be out of place at this time.

*Experiments with Paris Green on Tent Caterpillars.*—Professor Fernald reports that with one pound of Paris green to 1,000 gallons of water, all the caterpillars placed on the leaves died within twelve days. One pound to 150 gallons of water burned the foliage and injured the tree considerably. The best proportion for use on apple trees appeared to be, one pound of Paris green to 200, 250 or 300 gallons of water; even the last-named strength killed all the caterpillars within two days; with a dilution of 400 gallons, all were dead in three days.

*Paris Green on the Gypsy Moth Caterpillar.*—That Paris green has failed to give entire success in killing the *Ocneria* caterpillar, is

the report of the Gypsy Moth Committee. The mixture used by them would seem to be an excellent one, viz., one pound to 150 gallons of water and two quarts of glucose. The glucose held the poison on the leaves during hard showers, and proved to be a useful addition, and preferable to any other substance tried for prolonging the effects of the arsenite. Yet this, they state, while destroying the young caterpillars, failed to kill those that were nearly mature. A grove of trees that had been twice sprayed with a strength of one pound to 100 gallons of water was afterwards entirely stripped of leaves. Although many of the caterpillars were killed, there were subsequently gathered from under the same trees over 1,100 living pupæ of *Oceria*. The Paris green used was several times analyzed and found to be fully equal to any in the market.

It is difficult to believe that foliage sprayed with a strong mixture of Paris green will not kill all caterpillars that feed freely upon it, and the statement above-made needs confirmation. It is not impossible that the nearly matured caterpillars which were not killed, may have fully matured and ceased feeding preparatory to their pupation; or the observations may have been during the two or three days of cessation from food that may precede the last of the larval moltings.

*Spraying for the Codling Moth.*—The following is quoted from the *American Cultivator*, of January 2d, 1892: A careful examination was made of two trays of unassorted apples, each containing one hundred specimens, the fruit in one tray being taken from a sprayed tree and the other from an unsprayed one adjoining. The apples were divided into three grades, No. 1 being perfect apples, No. 2 having one or two blemishes, and No. 3 being almost worthless. In the tray from the unsprayed tree, there were four perfect apples, 58 second-class, and 38 culls, while the tray filled from the sprayed tree contained 84 first-class, 9 second-class, and 7 culls. (*Insect Life*, iv, 1892, p. 288.)

E. G. Lodeman reports, in Cornell Bulletin 48, signal results in spraying for codling-moth in the very wet season of 1892.

*Spraying for the Plum Curculio.*—Reports from a number of fruit-growers in Ohio indicate that spraying with Paris green is considered an effective remedy for the plum curculio. It is thought that two ounces of the green to 50 gallons of water is sufficient, if three or four applications are made during the season; and that the use of the dilute Bordeaux mixture in connection with the insecticide will prevent injury to the foliage. The mixture of fungicides and insecticides was also used with beneficial effects on pear trees attacked by the curculio. (Abstract in *Experiment Station Record*, from Ohio Station Bulletin, No. 9, vol. iv, December, 1891.)

From an address made by W. J. Green, before the Ohio State Horticultural Society at its last meeting, and reported in the *Country Gentleman* of January 12th, 1893, it appears that while the effectiveness of arsenical spraying for the curculio is conceded, it can not be done with sufficient frequency during the long period of the curculio's presence — from May to August — without injuring the foliage and causing the leaves to fall. A large degree of protection, however, to the foliage may be secured by using a dilute Bordeaux mixture with the Paris green. The following is the formula given: Lime, 4 pounds; sulphate of copper, 4 pounds; Paris green, 4 ounces; water, 50 gallons. This mixture was found satisfactory for European plums, but damaged the American varieties. With the Paris green reduced to two ounces, very little harm resulted, but it was questioned if this proportion of the arsenite would prove effective against the curculio.

*A New Contact Insecticide.*—The Gypsy Moth Committee in Massachusetts have found by experiment that the soap-powders, such as "Gold Dust" and "Babbitt's Continental Washing-powder," are deadly to caterpillars when properly applied, and were efficient in killing both the caterpillars and the pupæ of *Oeneria*. Babbitt's 1776 soap-powder was used in the proportion of one pound to six gallons of water, the powder being first dissolved in a little warm water, and sprayed upon the congregated caterpillars until they were well soaked with the liquid. It was thought that the "Gold Dust" gave the most uniform and satisfactory results. Unfortunately, "these solutions can not be used for spraying tender plants, as they injure the foliage. They can be used only on insects that cluster about the trunks of trees or smaller objects." (Forbush.)

*Creosote Oil as an Insecticide.*—For killing the eggs of the gypsy moth, the committee found that creosote oil, applied to the clusters by means of a brush so as to saturate them, penetrated and killed the eggs at once. The oil is made by the Carolina Oil and Creosote Company, at Wilmington, North Carolina, and is sold at fifteen cents a gallon by the barrel.

Experiments should be made to test the efficacy of this oil on the apple-bark and other scale insects, and on the eggs of such insects as have failed to be killed by applications of kerosene, as those of the pear-tree *Psylla*, the apple-tree aphid, the squash-vine borer (*Melittia cucurbitæ*), and the squash-bug (*Anasa tristis*).

*A Cheap Insecticide.*—The assistant chemist, B. W. Kilgore, of the North Carolina Experiment Station, has proposed the following cheap preparation for spraying fruit-trees: A mixture of one pound of the commercial white arsenic and two pounds of lime,

boiled together for half an hour in two to five gallons of water, and then diluting it to about one hundred gallons of water. The mixture prepared as above contains absolutely no soluble arsenic; and it was clearly shown that the "burning" or "scorching" of leaves is due entirely to the soluble arsenic present, and is in direct proportion to its amount.

*Arsenites with Bordeaux Mixture.*—Mr. Kilgore also reports: "Practical tests of the effect upon foliage of combinations of Paris green and London purple, each with Bordeaux mixture, were made. These combinations contained one pound of Paris green and one pound of London purple, separately, in 150 gallons of Bordeaux mixture, and applied to fig, grape, mulberry, blackberry, peach, pear, and apple leaves. Each mixture was tested for soluble arsenic, but none was found in any case. Nor did the slightest injury result to any of the leaves from these combinations. Some experiments were also made with combinations containing one pound of the arsenites to 100 gallons of Bordeaux mixture, with the same results as the above. Both theory and practice show these combinations to be perfectly harmless to foliage, and that they may be used with freedom."

These results are accompanied with elaborate tables, on which they are based. The use of lime for neutralizing the injurious effects of the arsenites is in accord with the publications of Professor Gillette, in Bulletin No. 10 of the Iowa Agricultural Experiment Station. Professor Kilgore's experiments were made in July, 1890, but their publication was delayed until a year thereafter. (See Technical Bulletin No. 2, of the North Carolina Agricultural Experiment Station, Raleigh, July 1, 1891.)

E. G. Lodeman, of the Cornell (N. Y.) Station (Bulletin 48), has found excellent results to follow the combination of Paris green and Bordeaux mixture for spraying apple trees to combat codling-moth and apple-scab. His conclusions upon this point are as follows:

"When Paris green was added to the Bordeaux mixture, the fungicidal action of the combination was more marked than when London purple was used in place of Paris green.

"Paris green has a certain fungicidal value, but in this respect it does not nearly equal the Bordeaux mixture.

"The value of Paris green as an insecticide does not appear to be materially affected, whether it is applied alone or in combination with the Bordeaux mixture.

"The insecticidal value of Paris green when used with the Bordeaux mixture was greater than that of London purple when similarly applied."

*Farmers' Bulletin on Spraying.*—A serviceable bulletin for the use of fruit-growers is one published in 1892, by the United States Department of Agriculture, entitled "Farmers' Bulletin No. 7. Spraying Fruits for Insect Pests and Fungous Diseases," 20 pages.

It discusses spraying with kerosene emulsion and the arsenites for insect pests, and spraying from the hygienic standpoint. Spraying for fungus diseases of the apple, pear, and other fruits. Does it pay to spray? The fungicides used in spraying. How and when to spray. Treatment of scab, powdery mildew, the leaf-blight, black-rot of the grape and anthracnose. Use of copper compounds from a hygienic standpoint.

This is perhaps the most convenient and reliable bulletin on spraying that has yet been prepared, and copies may probably be obtained by addressing the Department of Agriculture at Washington.

*Bulletins on Spraying and Insecticides.*—Several bulletins on these subjects have been published during the year 1892 and the preceding one, which would be found of service to fruit-growers, florists, nurserymen, and others. Among them are the following:

Information on Spraying Fruits. Pennsylvania State College Agr. Exp. Station, Bulletin No. 19, April, 1892.

Insecticides and Fungicides. Michigan Agr. Exp. Sta., Agricultural College, Bulletin No. 83, April, 1892.

The Spraying of Orchards. Ohio Agr. Exp. Sta., Wooster, vol iv, December, 1891.

Experiments with Fungicides and Insecticides. Hatch Exp. Sta., Amherst, Mass., Bulletin No. 17, April, 1892. 11 plates.

Injurious Insects and Insecticides; Spraying Machinery. Delaware College Agr. Exp. Sta., Newark, Bulletin No. 12, March, 1891.

Kerosene Emulsion. Michigan Agr. Exp. Sta., Agricultural College, Bulletin No. 76, October, 1891.

Spraying for Insect and Fungous Pests of the Orchard and Vineyard. New Jersey Agricultural College Exp. Sta., New Brunswick, Bulletin No. 86, April 4, 1892.

Spraying Apple Orchards in a Wet Season. Cornell University Exp. Sta., Ithaca, N. Y., Bulletin No. 48, December, 1892.

#### BOUNTIES FOR INSECT PESTS.

*Garden and Forest*, for December 21, 1892, records an interesting "Campaign against the Tent-caterpillar." The apple-tree tent-caterpillar has for several years past been an almost unendurable nuisance in various parts of Massachusetts, particularly in the vicinity of Boston. Entire trees and shrubs are completely stripped of their leaves, convert-

ing the fresh spring foliage into a painful and depressing scene, and robbing walks and drives of their natural rural beauty.

In order to arrest or mitigate, if possible, this evil, the Newton Horticultural Society and the Newton Center Improvement Association prepared and widely distributed a circular illustrating the insect in its several stages, giving a full description of its eggs, and offering prizes for the collection of the egg-belts, to be brought to the Horticultural Society before April 1st. As the result, \$75 was distributed in prizes and gratuities among the competitors, the first prize of \$15 being given to a young lad who presented over 15,000 belts.

The above effort having effected the destruction, as estimated, of 25,000,000 of eggs during the year, the society is encouraged to offer for the following year a reward of \$1 for every thousand belts brought in, and has invited contributions, that the work may be successfully carried on.

I would heartily recommend this method for localities in New York where the tent-caterpillar has become unusually abundant. Could other of our wide-spread insect pests be controlled by similar means, it would be a wise economy to employ children in the work by the payment of suitable rewards. Unfortunately, few insects offer so vulnerable a point of attack as does the apple-tree tent-caterpillar, in its shining egg-belt on a leafless tree. In cities and villages where the white-marked tussock-moth, *Orgyia leucostigma*, frequently strips the elms and horse-chestnuts of their foliage, the devastation for another year could be stayed by offering a certain sum per thousand, or by weight or measure, for the egg-deposit of the moth on its cocoon—so conspicuous in their snowy whiteness on the trunks and lower branches of trees and beneath window-sills and copings, during the months of August and September, or before they have become dingy from weathering.

In conclusion, I feel that I owe an apology for the length of my report, and I accordingly offer this: Your president and a number of individual members of the Society have from time to time manifested to me so deep an interest in entomological studies as directly bearing upon their pursuits and labors, that I have presumed upon a patient listening to whatever I had to present. The report, certainly, would have been much more brief had it been prepared for any other body than for the intelligent and appreciative membership of this Society, before whom I am always glad to appear and offer my humble tribute.

Respectfully submitted on behalf of the Committee on Entomology.

J. A. LINTNER,

*Chairman.*



(C)

LIST OF PUBLICATIONS OF THE ENTOMOLOGIST.

The following is a list of the principal publications of the Entomologist during the year 1892 — thirty-three are named,— giving title, place and time of publication and a summary of contents.

A similar list for the years 1870–1874 is appended.

Killing the Pea-Weevil. (Rural New Yorker, for April 2, 1892, li, p. 227, c. 2, 3 — 9 cm.)

*Bruchus pisi* may be killed in newly ripened pease by exposure for one hour to a temperature of 145° Fahr. The vapor of bisulphide of carbon is believed to be the best agent for killing the bean- and the pea-weevil.

Early "Grasshoppers." (Country Gentleman, for April 14, 1892, lvii, pp. 286–7, cols. 4, 1 — 28 cm.)

Insects taken in Washington Co., N. Y., hopping about on March 20th, are the young of the green-striped locust, *Chimarocephala viridifasciata* De Geer, noticed in the Second Report on the Insects of New York, as appearing in the winter of 1882 in different places in New York. Their life-history is sketched and reasons given why severe injuries may not be expected from these early appearances. Reference is made to the erroneous popular use of the name "grasshopper" for locust.

[See extended notice as *Chortophaga viridifasciata*, in pp. 330–334 of this report (ix).]

\*Cluster Flies—*Pollenia Rudis*. (Country Gentleman, for May 5, 1892, lvii, p. 358, c. 1, 2 — 54 cm.)

The fly identified and the names which it has borne; notice by W. H. Dall, of its occurrence at Geneva, N. Y., and elsewhere by other writers: its hibernation in houses: its principal features: how it may be killed.

[Extended in pp. 309–314 of this (Ninth) Report.]

Report of the State Entomologist for the Year 1890. (Forty-fourth Annual Report of the New York State Museum for the Year 1890, pp. 197–405, figs. 1–40.) Separate: Seventh Report on the Injurious and Other Insects of the State of New York [April 29], 1891, pp. 210, figs. 40.

The contents are: INTRODUCTORY: INJURIOUS INSECTS: *Aulacomerus lutescens*, the Poplar saw-fly. *Pyrrharctia isabella*, the Black-and-red Woolly

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\*The capitalization, etc., of the *Country Gentleman* is followed herein in the citation from it of titles of publications.

Bear. *Helophilus latifrons*—one of the Syrphus flies. *Chloropisca prolifica*, the Prolific Chlorops. *Dynastes Tityus*, the Rhinoceros Beetle. *Bruchus obsoletus*, the Bean-Weevil. *Bruchus rufimanus*, the European Bean-Weevil. *Bruchus lentis*, the Lentil Weevil. *Conotrachelus nenuphar*, the Plum curculio. *Cicada septendecim*, the Periodical Cicada. BRIEF NOTES ON VARIOUS INSECTS: *Ocneria dispar*, the Gypsy Moth. *Spilosoma Virginica*, the Yellow Woolly Bear. *Thyridopteryx ephemeraformis*, the Bag-worm. *Erebus odora*. *Tmetocera ocellana*, the Eye-spotted Bud-moth. *Cecidomyia balsamicola*, the Balsam Cecidomyia. *Cecidomyia* sp.? within a jumping gall. *Epilachna borealis*, the Northern Lady-bird. *Sitodrepa panicea*, as a Leather Beetle. *Aphodius fimetarius*, a Dung Beetle. *Saperda candida*, the Round-headed Apple-tree Borer. *Diabrotica 12-punctata*, the 12-spotted Diabrotica. *Phytonomus punctatus*: the fungus infesting it. *Monarthrum mali*, the Apple-tree Bark Beetle. *Aphis brassicæ*, the Cabbage Aphis. *Myrmeleon ? immaculatus*: a Strange Habitat for the Larva. *Dendroleon obsoletum*; a Climbing Ant-Lion. INJURIOUS ARTHROPODS: *Bryobia pratensis*, the Clover Mite. *Cermatia forceps*—a Household Centipede. APPENDIX. (A) ENTOMOLOGICAL CONTRIBUTIONS: The Insects of the Past Year and Progress in Insect Studies. Late Experiences with Insects Injurious to the Orchard and Garden. (B) LIST OF PUBLICATIONS OF THE ENTOMOLOGIST. (C) CONTRIBUTIONS TO THE DEPARTMENT. GENERAL INDEX.

Slugs on Pear Trees. (Country Gentleman, for May 19, 1892, lvii, p. 387, c. 2, 3—20 cm.)

An attack on pear-trees in Orange, N. J., is recognized as that of the pear-tree slug, *Eriocampa cerasi* (Peck), which also occur on cherry, quince, and plum trees. The two broods are noticed. It may be killed by powdered hellebore, dry or in water, spraying with Paris green, dusting with powdered lime or even with road dust unless just before molting. Are there three broods in New Jersey?

[See pages 335, 336 of this Report (ix).]

The Cherry-tree Aphis on the Wild-goose Plum. (Country Gentleman, for May 26, 1892, lvii, p. 407, c. 4—16 cm.)

Insects from Central Kentucky as quite injurious to wild-goose plum trees and "observed also on the burning bush," are *Myzus cerasi* (Fabr.). Although for a long time thought to occur only on the cultivated cherry, it is now met with occasionally on the plum. Spraying with strong whale-oil soap solution would be effective if all the insects were reached by it. Kerosene emulsion would be preferable, if used before the aphids are protected by the curling of the leaves. This aphis is not found on the burning bush: another black species, *Aphis rumicis* (Linn.), was probably mistaken for it.

The Scurfy Bark-Louse. (Country Gentleman, for June 9, 1892, lvii, p. 458, c. 1—26 cm.)

Scale-insects on apple twigs from High Bridge, N. J., are *Chionaspis furfurus* (Fitch), occurring on most of the fruit-trees, and distributed from the Atlantic to the Pacific, and recently found in Europe. The specimens

received on small twigs, were of an unusually elongate shape. Spraying with kerosene emulsion soon after they are hatched, will kill them. Other remedies are application of "heavy-oil," soap-suds and carbolic acid, and other means mentioned in the Country Gentleman, for March 1, 1888, p. 169.

The Harlequin Cabbage-Bug. (Country Gentleman, for June 9, 1892, lvii, p. 458, c. 1, 2—27 cm.)

The conspicuous and peculiar markings of this insect, the *Murgantia histrionica* (Hahn.), received from Woodbury, N. J., have given to it its specific and popular name. It feeds on most of the *Cruciferae*; its distribution is noticed: now for the first time received from New Jersey. Recommendations for destroying it are: sprinkling with hot water; trapping with leaves placed on the ground; burning the rubbish of the fields; destroying the hibernated insects while ovipositing in the early spring, and crushing the eggs. The insect develops rapidly—may mature from eggs within three weeks.

[See pages 315-317 of this Report (ix).]

The Pear-tree Psylla. (Science for June 17, 1892, xix, pp. 343, 344—30 cm.)

Recent injuries to pear-trees from two pests, *Diplosis pyrivora* and *Psylla pyri*: when they were introduced: injuries from the latter in the Hudson river valley: what the insect is: when it appears in its several stages: should not be hard to control: may be killed by spraying when first hatched, and even after it is winged, with kerosene emulsion: the Vermorel nozzle preferable against the winged insect, and how to use it.

[See extended notice in pp. 317-329 of this Report (ix).]

The Apple-tree Tent-Caterpillar. (Country Gentleman, for June 23, 1892, lvii, p. 492, c. 1—11 cm.)

In reply to inquiry from Boston, Mass., for preventive means against caterpillars which have defoliated fifty apple-trees: the insect, *Clisiocampa Americana* Harris, is easily controlled by two methods—either by collecting the egg-belts while the trees are leafless and burning them, or by destroying the nests with the contained larvæ as soon as they can be discovered in early spring, during the cool part of the day.

Aster and Lily Pests. (Country Gentleman, for June 23, 1892, lvii, p. 492, c. 1—12 cm.)

The "minute white objects" associated with myriads of small red ants (specimens not submitted), covering the roots of asters in Riga, N. Y., are probably a species of plant-louse, and perhaps the *Aphis Middletonii* of Thomas (8th Illinois Report). The "worms" boring into the stalk of lilies below the ground, judging from the brief description sent, are one of the Myriapods or "thousand-legged worms." These may be killed by lime-water or nitrate of soda in solution. For the Aphides, withdraw the ground and apply strong soap-suds, or tobacco water or pyrethrum water, or pour hot water on the ground about the plants.

[Published in pp. 371, 372 of this Report (ix).]

The Cow-Horn Fly. (Country Gentleman, for June 30, 1892, lvii, p. 501, c. 2—16 cm.)

A remedy is asked for the fly, *Hæmatobia serrata*, which is occurring "in millions" in Madison county, N. Y. It is rapidly increasing and spreading throughout this State, and has also appeared in Ohio, Kentucky and Mississippi. Any of the greases or oils with some carbolic acid, if rubbed on the cattle, will usually act as a repellent, as also tobacco-dust rubbed into the hair. Spraying the cattle with kerosene emulsion two or three times a week will drive away the flies and prevent their return. The larvæ may be killed by daily spreading thinly the fresh droppings where they breed or by sprinkling lime thereon.

The Meal-Worm, *Tenebrio Obscurus*. (Country Gentleman, for June 30, 1892, lvii, p. 501, c. 2, 3—18 cm.)

Insects infesting wheat in a granary in Buckland, Va., are the American meal-worm, *Tenebrio obscurus* Fabr. The larva and beetle are characterized; is more injurious than the European *T. molitor*, as it prefers dry and sound flour; both infest granaries, mills, and farm houses. The best remedy for it is bisulphide of carbon, used as directed, one ounce to a hundred pounds of grain. The dead insects should be removed from the grain, as serious results have followed their having been ground into the flour.

[Extended in pp. 307-309 of this Report (ix).]

The Pear-Leaf Blister. (Country Gentleman, for June 30, 1892, lvii, p. 504, c. 2—7 cm.)

Leaves from Carlton, N. Y., are nearly covered with the pear-leaf blister, caused by the operations of the microscopic mite, *Phytoptus pyri*. Sulphur has been used for killing, but when applied it can reach so few of the concealed mites that it is not effective. The best remedies are found in picking off and burning the infested leaves or the branches, heavy pruning in the winter or spring, or in the removal of the infested tree. Reference is made to the *Country Gentleman* of October 2d, 1890, for further information of the *Phytoptidae* and of the species.

Injuries to a Maple Tree. (Country Gentleman, for July 21, 1892, lvii, p. 552, c. 2—8 cm.)

The tree has probably been attacked by the maple-tree borer, *Glycobius speciosus*. The remedies for this attack are given. The eggs observed under a thin gray film on the bark could not have been the source of the attack.

A Cauliflower Pest. (Country Gentleman, for August 11, 1892, lvii, p. 600, c. 3—6 cm.)

*Pieris rapæ* is identified as injurious to cauliflowers at Cheviot-on-Hudson. Recommendation is made to mix fresh pyrethrum powder with four times its bulk of flour, and, after it has stood for twenty-four hours, to dust it thinly over the caterpillars.

Pear-eating Beetle. (Country Gentleman, for September 8, 1892, lvii, p. 667, c. 2, 3—8 cm.)

A beetle, from Buffalo, N. Y., eating into pears, is the Indian Cetonian, *Euphoria Inda* (Linn.). Its habits are given, as also its injuries to fruit and vegetables, and means of protection from it.

Roseleaf Caterpillar. (Country Gentleman, for September 8, 1892, lvii, p. 667, c. 3—5 cm.)

A caterpillar feeding on roseleaves at Cos Cob, Conn., the prominent features of which are given, is one of the *Cochliopode*, but can not be identified at present.

[It was subsequently identified as *Parasa chloris* H.-S.]

Strawberry Root Grub. (Country Gentleman, for September 8, 1892, lvii, p. 667, c. 3—4 cm.)

For the white grub infesting strawberry roots, remedies named are digging out, and pouring kerosene emulsion over the roots.

The Black Blister Beetle. (Country Gentleman, for September 15, 1892, lvii, p. 689, c. 3—7 cm.)

In reply to complaint from Meriden, Conn., of this beetle, *Epicauta Pennsylvanica* (De Geer), several of the food-plants of the insect are given, and remedies for it, as beating into a vessel of water with kerosene, dusting with pyrethrum powder, and inclosing the blossoms in gauze during the prevalence of the beetles.

The Hag-Moth Caterpillar. (Country Gentleman, for September 22, 1892, lvii, p. 709, c. 3—8 cm.)

A caterpillar from East Greenwich, R. I., is the *Phobetron pithecium* (Sm.-Abb.). Its peculiar features are given. It is often received for name in August and September. Its food-plants and stinging powers.

Remedy for the Army Worm. (Country Gentleman, for October 6, 1892, lvii, p. 750, c. 3—7 cm.)

The best remedy for the army worm in its migrations is ditching with walls sloping inward and deep holes at intervals. Other remedies are barriers of boards coated with tar, rolling the ground when smooth to crush the worms, and poisoning with Paris green, strips of the threatened crop in advance of attack.

Weevil in a Granary. (Country Gentleman, for October 6, 1892, lvii, p. 750, c. 3—5 cm.)

Bisulphide of carbon—about one pound to a ton of grain, in an open vessel on top of the grain will kill the weevils in a tight granary, without injury to the grain, or affecting it for food purposes.

The spotted Horn-Bug. (Country Gentleman, for October 13, 1892, lvii, p. 767, c. 3—14 cm.)

A beetle of this species, *Dynastes Tityus* (Linn.), is received from Magnolia, Maryland, where it was taken in a ripe pear. Its more prominent features are given. It is a southern form which has once been taken in the State of New York. Not having been recorded as injurious to fruit, if it had eaten into the pear in the above instance, it would indicate a possibility of its becoming a fruit pest. October is apparently a little late for the occurrence of the beetle.

[See page 342 of this Report (ix).]

Cabbage Worms. (Country Gentleman, for October 13, 1892, lvii, p. 767, c. 4—6 cm.)

In reply to inquiry whether the published remedy of sprinkling corn meal over the leaves when wet with dew will destroy the caterpillars, answer is made: The efficiency of the proposed remedy is improbable. It has met with ridicule in some scientific journals. A test of it can easily be made.

[Some late experiments seem to show that the caterpillars can be killed by the meal.]

Tent Caterpillar. (Country Gentleman, for October 13, 1892, lvii, p. 767, c. 4—5 cm.)

A formula for killing this insect, consisting of kerosene, water, castile soap, and caustic potash, in proportions given, of which its value is asked, does not promise to kill the caterpillars by contact or through feeding. Reliable methods are collecting and burning the egg-belts, and wiping out and crushing the nests when first formed.

Kerosene Emulsion. (Country Gentleman, for October 13, 1892, lvii, p. 767, c. 4—8 cm.)

Replying to inquiry—the method of making the emulsion is given, and directions for applying it to strawberry plants for killing the grubs at the roots.

Will the Cow-Horn Fly Remain with us? (Country Gentleman, for October 13, 1892, lvii, p. 769, c. 4—18 cm.)

Although very injurious in New Jersey in 1888, it is now no more annoying in that State than is *Stomoxys calcitrans*. Two or three years hence it will probably have diminished in number to the same extent in the State of New York, although it will doubtless continue as a pest in localities favorable for its multiplication. Will the *Hematobia serrata* eventually drive away the *Stomoxys* (an early importation) after the manner of many newly infested pests, as *Pieris rapæ* has done with *Pieris oleracea*? The name of "Buffalo" fly is improperly applied to this insect: suggestion as to how it may have received it.

A Thrips Attack on Cabbage. (Country Gentleman, for October 27, 1892, lvii, p. 809, c. 2, 3 — 27 cm.)

Cabbage and cauliflower leaves received from Kingston, Pa., abound with a minute Thrips, the particular species of which can not be named: it is probably an undescribed species, no attack of the kind having been previously reported. The number of genera and species of Thrips: their low position among insects: referred to Thysanoptera: their general features: carnivorous and herbivorous: food plants: the nature of injury to cabbage and cauliflower by this species: pyrethrum will prevent injury by it.

The Tischeria Apple-Leaf Miner. (Country Gentleman, for October 27, 1892, lvii, p. 809, c. 3, 4 — 20 cm.)

Reddened leaves from an orchard in Schenectady, N. Y., show the attack of *Tischeria malifoliella* Clemens. The mines and the process of their construction are described. They contain at this time the larva, which hibernates in the leaves and transforms to the pupa and imago in the spring. The remedy would be, collecting and burning the infested fallen leaves during the autumn or winter. The insect extends over a large part of the United States into Texas. It is rather local, and seldom, for reasons given, proves particularly injurious. It occurs also on *Crataegus*, blackberry, and raspberry.

Distribution of the Pear Psylla. (Country Gentleman, for November 3, 1892, lvii, p. 831, c. 2, 3 — 13 cm.)

The probable introduction of *Psylla pyricola* at Salisbury, Conn., in 1832, is stated, together with its present known distribution. Request is made for information of its occurrence in other localities; and as aid in its recognition, its features and mode of operating are stated.

The Cow-Horn Fly in New York. (Country Gentleman, for November 10, 1892, lvii, p. 847, c. 1 — 10 cm.)

The interest attaching to the spread of insect pests into new territory, renders it desirable to ascertain the extent to which this fly has been distributed over the State of New York during the two and a half years that it has been known therein. Of the sixty counties of the State, it has been reported from twenty-eight. Information of its presence in any of the other thirty-two counties (named) would be gratefully received by the State Entomologist.

Apple-Tree Bucculatrix. (Country Gentleman, for December 22, 1892, lvii, p. 967, c. 2 — 8 cm.)

Cocoons from Clyde, N. Y., contain the pupæ of *Bucculatrix pomifoliella* Clemens. The transformations of the insect and the remedies for it, are named.

(D)  
PUBLICATIONS OF THE ENTOMOLOGIST DURING THE  
YEARS 1870-1874.

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[First Observation of *Pieris rapæ* in New York.] (Sunday Morning Press [Albany, N. Y.], for August 7, 1870, p. 4.)

Examples of this butterfly, introduced from Europe into Quebec about the year 1857, were taken within the city of Albany a few days since, and could be seen at the New York State Museum of Natural History.

“The Poisonous Cabbage-Worm.” (Albany Argus, for October 20, 1870.)

Newspaper statements of the poisonous nature of the *Pieris rapæ* larva, and of its poisoning the cabbage on which it feeds, are entirely unwarranted and untrue. Its excrement may render the cabbage unsuitable for table use unless properly cleansed. What the cabbage-worm is, how it was introduced and has been distributed, and the injuries caused by it.

The Recently Imported Cabbage-Butterfly — *Pieris rapæ*. [Read before the Albany Institute, November 2, 1870.] (The Albany Argus, for November 2, 1870. Proceedings of the Albany Institute, i, 1873, pp. 199-201.)

First seen in Albany in the summer of 1870; brought to the United States in 1857; its distribution; its transformations and life-history; probability of its spread throughout the United States; no parasite yet attacking it.

On *Graptæ interrogationis* and *Fabricii* EDW. (Transactions of the American Entomological Society, for December, 1870, iii, pp. 197-204.) Separate with cover and half-title.

Exception is taken to the conclusions of Mr. W. H. Edwards that the black-winged *Grapta (umbrosa)* is the *interrogationis* of Fabricius, and the red-wing, the *C-aureum* of the same author. The uncertainty and confusion among different authors as to *C-aureum* is reviewed. The *umbrosa* form seems not to have been described by any of the old authors. [It subsequently proved to be a dimorphic form of *G. interrogationis*, as shown by Mr Edwards.]

*Spectrum femoratum*. (Country Gentleman, for August 31, 1871, xxxvi, p. 552, c. 2 — 2 cm.)

Identification of the species from Columbia, Missouri. It is commonly known as the “walking-stick” or “spectre-insect.”

[*Dryocampa imperialis* HARRIS.] (Country Gentleman, for September 21, 1871, xxxvi, p. 600, c. 2 — 8 cm.)

Description of the moth and note on its transformations and habits.

*Pieris rapæ* Parasite. (American Naturalist, v. 1871, p. 742. Canadian Entomologist, for November, 1871, iii, p. 197.)

The cabbage butterfly has been attacked by a parasite. Large numbers of a species of *Pteromalus* were bred from chrysalids of *P. rapæ* during the last of September. It is thought to be identical with the *P. puparum* which preys upon it in Europe.

Cabbage Butterfly. (Country Gentleman, for November 16, 1871, xxxvi, p. 728, c. 1 — 17 cm.)

Notice of the larvæ of *Pieris rapæ* in Delaware; notes on the species and discovery of its parasite, *Pteromalus puparum*, in Albany, N. Y., in October of the present year.

Cut Worms in Corn. (Country Gentleman, for May 30, 1872, xxxvii, p. 339, c. 2 — 11 cm.)

Caterpillars which had cut off the corn below the surface of the ground from several acres in Queens county, N. Y., after the manner detailed, are identified as young cut-worms, which in their immature state can not be referred to any of the twelve or fifteen known species. Judging from their habits as given, they may be *Mamestra Arctica* Boisid.

Spindle Worms. (Country Gentleman, for June 13, 1872, xxxvii, p. 376, c. 1, 2 — 8 cm.)

Caterpillars eating into the stalks of corn in Dutchess county, N. Y., are probably a species of *Gortyna*, as several of the genus are known as notorious burrowers in stalks, etc.

Apple-Twig Borer on Pear Trees. (Country Gentleman, for June 13, 1872, xxxvii, p. 375, c. 2, 3 — 32 cm.)

Habits, distribution, and injuries of the species, *Amphicerus bicaudatus* (Say), and remarks on the importance of a knowledge of the natural history of injurious insects.

[See *Second Report on the Insects of New York*, 1885, pp. 125-132, figs. 28-31.]

Hessian Fly. (Country Gentleman, for June 13, 1872, xxxvii, p. 376, c. 2 — 6 cm.)

Identification of the "flax-seeds" from Franklin county, Ohio, where they occur in abundance at the joints of the wheat stalks.

Bark Louse. (Country Gentleman, for July 11, 1872, xxxvii, p. 440, c. 2, 3 — 8 cm.)

The insect infesting a thorn-hedge in Windsor, Canada, is a species of *Coccus*. Remarks on the *Coccidæ*, their habits, the means and the best time for destroying them.

Owl Beetle. (Country Gentleman, for July 18, 1872, xxxvii, p. 456, c. 1 — 9 cm.)

The *Alaus oculatus* identified, with description and habits, and mention of the frequent occurrence of its larva in old apple-trees.

Revision of Some of the American Butterflies. (American Naturalist, vi, 1872, pp. 354-359.)

Review of a publication under the above title, published by Samuel H. Scudder, in the Report of the Peabody Academy of Science for 1871, pp. 24-82.

Biography of *Hemileuca Maia* (Druyr). (Entomological Contributions, 1872, pp. 5-21, pl. 2, figs. 1-3. Twenty-third Annual Report on the N. Y. State Cabinet of Natural History, for the year 1869. 1873, pp. 137-153.) Also in the Swiss Cross, for April, 1887, i, pp. 135-139, figs. 1-3.

Presents the life-history of this Bombycid moth under the following heads: the egg; egg-belt; egg-cement; oviposition; hibernation; hatching; egg-shell; young larva; first molt; second molt; third molt; sting of larva; fourth molt; fifth molt; mature larva; food-plants; parasites; pupation; the pupa; imago; metamorphoses; discrepancies; rarity; habits of the imago; geographical range; synonymy; additional note on pupation, etc.: an interesting variety of the moth.

Observations on *Melitæa Phaëton* (Fabr.). (Entomological Contributions, 1872, pp. 22-25. Twenty-third Report on the N. Y. State Cabinet of Natural History, for the year 1869. 1873, pp. 154-157.)

Rarity of the species; eggs obtained from a female described; death of the larvæ after preparing for hibernation; fatality attendant on hibernation; *Chelone glabra*, the food-plant; the insect confined to a very small area at Center, N. Y.; other localities for it; the genus *Melitæa*, with the exception of *Phaëton*, confined to west of the Mississippi river; seventeen species known according to Edwards [now increased to thirty-seven].

Notes on *Melitæa Nycteis* (Doubl.). (Entomological Contributions, 1872, pp. 26, 27, fig. 14 of pl. 8. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 158, 159.)

Larvæ found feeding on *Helianthus divaricatus* L. are described, and after a subsequent molt and at maturity: the chrysalis is described and figured. Another colony taken from the same food-plant were carried through two molts, after which they became lethargic and died before hibernation. Note on its abundance at Center, N. Y., and absence from other neighboring localities.

Notes on *Pieris oleracea* (HARRIS). (Entomological Contributions, 1872, pp. 28, 29. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 160, 161.)

The eggs and the emergence of the larvæ, with notes on the four molts. From the egg to the imago is but three weeks. There are three broods each year, and there may be a fourth as shown by data given.

Descriptions of New Species of Nisoniades. (Entomological Contributions, 1872, pp. 30-36, figs. 1-12 of plate 7. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 162-168, figs. as above.)

Description of *N. Icelus* and its egg, time of its appearance, and the mythological import of its name. Description of *N. Lucilius* and its comparison with *N. Persius* Scudd., which it resembles; abundant at Schoharie, N. Y. *N. Ausonius* is described from the only example that has occurred; it seems to be the rarest of the Nisoniades.

Description of a New Sphinx. (Entomological Contributions, 1872, pp. 37-39, figs. 8-13 of pl. 8. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 169-171, figs. as above.)

The male and female moths of *Ellema pineum* are described, and also the larva from examples taken on pines at Schoharie, N. Y. Comparison is made with *E. Harrisii* and *E. pinastri*. Reference is made to the larva of *E. coniferarum* (Sm -Abb.).

List of Sphingidæ occurring in the State of New York. (Entomological Contributions, 1872, pp. 40-43. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 172-175.)

Forty species are recorded, arranged under their subfamilies, and giving their principal synonyms.

List of Butterflies Occurring in the State of New York. (Entomological Contributions, 1872, pp. 44-47. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 176-179.)

The list embraces 113 species, with notes on those of rare occurrence, and mention of 13 others which may be presumed to occur in the State.

Calendar of Butterflies for the Year 1869. (Entomological Contributions, 1872, pp. 48-55. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 180-187.)

Contains notes on sixty-three species as they appeared successively, from *Thecla Irus* Godt., on April 27th, to *Pamphila Leonardus* (Harris) on August

20th; giving also comparative abundance, number of broods, dates when observed, habits, observations on their larvæ, etc.

Dates of Collection of New York Heterocera. (Entomological Contributions, 1872, pp. 56-65. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 188-197.)

Contains dates of collection of ninety-four species during the year 1869, under their respective families, and of two hundred species in years prior to 1869. Also notes on the following species: *Darapsa Myron*, *Trochilium (Bembecia) marginatum*, *Lycomorpha pholus*, *Orgyia leucostigma*, *Eudryas unio*, *Ichthyura inclusa*, *Hyperchiria Io*, *Anisota senatoria*, *Nadata gibbosa*, *Platyserura furcilla*, *Xyleutes [Cossus] robiniv*, *Gonopteryx libatrix*, *Cleora pulcherrima*, and *Zerene catenaria*.

List of North American Lepidoptera Contained in "Species Général des Lépidoptères," by A. Guenée. (Entomological Contributions, 1872, pp. 66-80. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 198-212.)

Embraces above six hundred species described in the six volumes of the above-named work, with reference to volume and page; particular habitat when given, and also designation of the species credited to, or known by the compiler to occur in, the State of New York, of which there are two hundred and fifty-three species.

Notes on *Cucullia intermedia* SPEYER. (Entomological Contributions, 1872, pp. 81-84, figs. 5, 6, 7 of pl. 8. Twenty-third Report on the N. Y. State Cabinet of Natural History, 1873, pp. 213-216, figs. as above.)

The larva is described, its probable food-plants named; its earthen cocoon and how constructed, and its pupa; the two annual broods; how the imago feeds. Note on the larva of *Cucullia convexipennis* and its cocoon. Remarks on a translation of a paper by Dr. A. Speyer "On *Cucullia intermedia* and *C. lucifuga*" given in the following pages (85-90); and on the valuable studies made by him of our American Noctuidæ. Mr. Meeke's field collections, and the cyanide bottle.

On the Larva and Imago of *Sesia diffinis* HARRIS. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 109-111. Entomological Contributions — No. II, 1872, pp. 5-7.)

The larva, taken from bush-honeysuckle, *Diervilla trifida*, is described: remarks on the "annulets" (usually eight) in which the segments of the *Sphingidæ* are divided: flight and other habits of the imago in the breeding

cage: the slightly attached wing-scales in this and allied species: the species abroad.

[Now known as *Hemaris diffinis* (Boisd.).]

Transformations of *Sesia Buffaloensis* GR.-ROB. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 112, 113. Entomological Contributions — No. II, 1872, pp. 8, 9. Also in Transactions of the American Entomological Society, xv, 1888, p. 105.)

Descriptions of the egg and of the larva in its five stages (four molts), of its cocoon, and its pupation. The eggs and larva were found on the snowball, *Viburnum opulus*.

[Now generally known as *Hemaris Buffaloensis* (Gr.-Rob.).]

On the Larva and Pupa of *Thyreus Abbotii* SWAINSON. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 114–116. Entomological Contributions — No. II, 1872, pp. 10–12.)

The "male" and "female" larvæ and the pupa are described, with reference to marked variations in the larvæ of *Deilephila lineata*: and remarks on the pupation of *T. Abbotii* occurring either above or below the surface of the ground.

[The two forms of this larva have since been shown to be simply dimorphic and not, as for a long time supposed, sexual.]

On the Larva of *Philampelus Achemon* (DRURY). (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 117, 118. Entomological Contributions — No. II, 1872, pp. 13, 14.)

Description of the egg, the young larva, the larva after each of its four molts, and at maturity.

*Smerinthus geminatus* SAY and its Supposed Varieties. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 119–127. Entomological Contributions — No. II, 1872, pp. 15–23.)

Description of the egg and of the larva in its first stage and after its first, second and third molts (the usual fourth molt of the Sphingidæ did not occur), and at maturity: notes on the pupation: time passed in the several stages: is double-brooded: a variety bred having but one ocellated spot on the secondaries: the *S. Jamaicensis* of Drury: *S. Cerisyi* Kirby believed to be a variety of *S. geminatus* [since shown to be a good species]: *S. ophthalmicus* compared with *S. geminatus* and *S. ocellatus* of Europe: bibliography of *S. geminatus*.

Transformations of *Daremma undulosa* WALKER. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 128-131. Entomological Contributions—No. II, 1872, pp. 24-27.)

Remarks on rearing Lepidopterous larvæ on their living food-plant inclosed in a net. Description of the larva of *D. undulosa* in each of its five stages, and of the pupa: its food-plants.

Notes on *Platarctia Parthenos* (HARRIS). (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 132, 133. Entomological Contributions—No. II, 1872, pp. 28, 29.)

Notes on the young larva and dates of seven molts, hibernation and pupation, and markings of the imago.

[In the Smith "List of Lepidoptera of Boreal North America," 1891, this species is referred as a synonym to *hyperborea* of Curtis.]

Notes on *Euprepia Americana* (HARRIS). (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 134, 135. Entomological Contributions—No. II, 1872, pp. 30, 31.)

Description of the egg and notes on the larval molts: regarded by some writers as identical with *caja* of Europe: Packard's description of the larva.

[Catalogued as a variety of *E. caja* (Linn.) in the Smith List of Lepidoptera.]

Notes on *Euchaetes egle* (DRURY). (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 136, 137. Entomological Contributions—No. II, 1872, pp. 32, 33.)

The caterpillar described in its last three stages with their habits: parasites from the larvæ: a difficult species to carry to its imago stage.

Transformations of *Lagoa crispata* PACKARD. Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 138-145. Entomological Contributions—No. II, 1872, pp. 34-44.)

Its eggs, from *Quercus ilicifolia*, described: the young larva, and habits and features after each of its five molts: its stinging power: the cocoon with its peculiar lid: pupation, and the pupa: emergence of the imago: abundance of the larvæ at Center, N. Y.: a parasitic attack.

Transformations of *Hyperchiria Io* (FABR.). (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 146-149. Entomological Contributions — No. II, 1872, pp. 42-45.)

The caterpillar described after its last four molts and at maturity; processionary habits in its second stage: its pupation: its food-plants: the true *Io* of Fabricius — not *varia* of Walker.

Transformations of *Eacles imperialis* (DRURY). Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 150-154. Entomological Contributions — No. II, 1872, pp. 46-50.)

Description of the egg, the first larval stage, the four subsequent stages, and death from bacterial disease. A number of nearly full-grown larvæ collected from pines, *Pinus strobus*, in September, and their transformations to the imago.

Larval Notes on *Anisota senatoria* (SMITH). (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 155, 156. Entomological Contributions — No. II, 1872, pp. 51, 52.)

Oviposition on under surface of oak leaves. *Quercus prinoides*, in July: the four molts of the larvæ and pupation. Trains on the New York Central railroad stopped by the caterpillars on the rails: their great abundance annually at Center, N. Y.

Calendar of Butterflies for the year 1870. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 157-167. Entomological Contributions — No. II, 1872, pp. 53-63.)

Observations of seventy-three species of butterflies occurring in six localities in the vicinity of Albany during the spring and summer of 1870, indicating each day of occurrence, are given in tabular form. Twenty-nine species are noted at one locality on June 16th. Also, notes on the abundance, condition, time of appearance of sexes, successive broods, etc., at various dates from May 3d to October 21st.

Dates of Collection of some Heterocera for 1870. (Twenty-fourth Annual Report on the N. Y. State Museum of Natural History, for the year 1870: 1872, pp. 168-170. Entomological Contributions — No. II, 1872, pp. 64-66.)

Embraces twelve species of Sphingidæ, nineteen species of Bombycidæ, twenty-eight species of Noctuidæ, and fourteen species of Phalænidæ.

*Hypena scabra* (FABR.) and *H. erectalis* GUEN. (Canadian Entomologist, May, 1873, v, pp. 81, 82.)

The two forms hitherto regarded as distinct species are found to be the same, the former being the male and the latter the female. Dr. Speyer's studies on these forms. Reference by the same author of *Depressaria Ontariella* Bethune to *D. heracliana* DeGeer.

Entomology. [Remarks on Myrmeleon, Termes, et cet., at a Field Meeting of the Albany Institute at Schoharie, N. Y., June 7, 1873.] (Albany Evening Times, for June 9, 1873, xvii, p. 3, c. 3, 4—35 cm. Proceedings of the Albany Institute, 1878, ii, pp. 48-50.)

Remarks upon the appearance, habits, etc., of the Ant-lion, Myrmeleon sp., the white ant (*Termes flavipes*), the cabbage butterfly (*Pieris rapæ*), several caterpillars, and other insects exhibited, of the day's collection.

Economic Entomology, etc. [Remarks made at a Field Meeting of the Albany Institute at Watkins Glen, N. Y., June 27, 1873.] (Albany Evening Times, for June 30, 1873, xvii, p. 3, cols. 3, 4—62 cm. Proceedings of the Albany Institute, ii, 1878, pp. 65-69.)

On the omnipresence of insects infesting our food, injuring clothing, and sometimes attacking our persons. The province of the economic entomologist is to guard against these depredations. When powerless to resist them, parasites often come to our aid, as did *Pteromalus puparum* in controlling *Pieris rapæ*. The parasitic habits of *Rhyssa atrata*, and remarks on *Pyra-meis Atalanta*, *Melitæa* species, and *Deloyala* [*Coptocyla*] *clavata*.

Caterpillar [on apple tree]. (Country Gentleman, for July 17, 1873, xxxviii, p. 456, c. 2—6 cm.)

Caterpillars from Ottumwa, Iowa, prove to be *Notodonta concinna*: their habits, food-plants, how recognized and how they may be destroyed.

Coccus Insect on the Pine. (Country Gentleman, for August 21, 1873, xxxviii, p. 535, c. 1, 2—23 cm.)

Features of *Coccus pinicorticis* Fitch, its operations, and remedies for it, in answer to inquiry from Tivoli, N. Y., where large trees are being killed by it.

[See extended notice in the *Second Report on the Insects of New York*, pp. 180-187, figs. 48-53, as the pine-bark Chermes, *Chermes pinicorticis* (Fitch).]

On the Larva of *Eudryas unio* (Hübner) and Allied Forms. (Twenty-sixth Annual Report on the N. Y. State Museum of Natural History, for the year 1872: 1874, pp. 117-124, figs. 1-5. Entomological Contributions — No. III, May, 1874, pp. 117-124.)

Larvæ of *E. unio*, found feeding abundantly on *Epilobium coloratum*, described at maturity. The allied species are *Alypia octomaculata* (Hübner) *Psycomorpha epimenis* (Drury), and *Eudryas grata* (Fabr.). Comparisons are made between these species, and figures given of their larval and perfect stages.

Transformations of some Bombycidae. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 125-128. Entomological Contributions — No. III, 1874, pp. 125-128.)

The transformations of the following-named species are given: *Platysamia Cecropia* (Linn.), *Callosamia Promethea* (Drury), and *Actias Luna* (Linn.).

Descriptions of the Larvæ of some Bombycidae. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 129-134, figs. 6, 7. Entomological Contributions — No. III, pp. and figs. as above.)

Descriptions are given of the following: *Parorgyia parallela* Gr.-Rob., *Apatelodes Angelica* (Grote), *Ceriodasys* [*Schizura*] *unicornis* (Sm.-Abb.) with figures, *Platyserura furcilla* Packard, with figures, *Dryocampa rubicunda* (Fabr.), and *Tolype celleda* (Stoll).

Descriptions of the Larvæ of some Noctuidæ. (Twenty-sixth Report of the N. Y. State Museum of Natural History, 1874, pp. 135-141. Entomological Contributions — No. III, 1874, pp. 135-141.)

*Acronycta Americana* Harris MS. [is *Acronycta funeralis* Gr.-Rob.], *Acronycta morula* Gr.-Rob., *Ceramica picta* (Harris) [is *Mamestra picta*], *Cucullia convexipennis* Gr.-Rob., *Cucullia asteroides* Guenée, and *Catocala* sp.?, are described.

Notes on some New York Bombycidae. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 142-156, figs. 8-11. Entomological Contributions — No. III, 1874, pp. and figs. as above.)

Contains descriptions or notes, mainly larval, of the following species: *Callimorpha Leontii* Boisid., *Arctia Arge* (Drury), *Spilosoma Virginia* (Fabr.), *Spilosoma latipennis* Stretch, *Euchetes Oregonensis* Stretch, *Euchetes collaris* (Fitch), *Ichthyura rau* (Fitch), *Halisdota caryæ* (Harris), *Orgyia leucostigma* (Sm.-Abb.), *Empretia stimulea* Clemens, *Phobotron*

*pithecium* (Sm.-Abb.), *Lithacodes* [*Limacodes*] *fasciola* (Her.-Sch.), *Nadata gibbosa* (Sm.-Abb.), *Notodonta* sp.?, *Edema albifrons* (Sm.-Abb.), *Cerura borealis* (Boisd.), *Telea Polyphemus* (Linn.), *Actias Luna* (Linn.), *Hemileuca Maia* (Drury), *Gastropacha Americana* Harris, *Clisiocampa Americana* (Harris), *Ctenucha virginica* (Charp.), and *Scepsis fulvicollis* (Hüb.).

Notes on some New York Noctuidæ. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 157-167, fig. 12. Entomological Contributions — No. III, 1874, pp. and figs. as above.)

The following species are noticed: *Dipthera deridens* Guenée (with figure of larva), *Acronycta Americana* Harris MS., *Acronycta oblinata* (Sm.-Abb.), *Agrotis tricolor* nov. sp., *Hadena lignicolor* (Guenée), *Hadena* [*Mamestra*] *adjuncta* (Boisd.), *Cucullia florea* Guen., ?*Chariclea exprimens* (Walker) [*Pyrrhia umbra* Hüb.], *Chamyris verintha* (Treits.), *Plusia ballua* (Hüb.), *Plusia seroides* Grote, *Scoliopteryx libatrix* (Linn.), *Catocala parta* Guen., *Mesographe stramentalis* Hüb. [*Evergestis straminialis* Hüb.], *Nematocampa filamentaria* Guen., *Ennomos magnaria* Guen., *Amphidasys* [*Eubjia*] *vognataria* Guen., *Abra. vas* [*Eufitchia*] *ribearia* Fitch. Also, Notes on the seasons of 1858 and 1859.

Description of New Species of *Cucullia*. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 168-176, figs. 13, 14. Entomological Contributions — No. III, 1874, pp. and figs. as above.)

Describes and figures *Cucullia Speyeri* from examples taken at Albany and Sharon Springs, N. Y., with remarks on the five other previously known N. American species [fifty-two species are now catalogued from boreal North America], and characterization of the orbicular spot in eleven native and European species: also, describes *Cucullia serraticornis* from examples received from California.

Observation of some New York Rhopalocera for the year 1871. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 177, 178. Entomological Contributions — No. III, 1874, pp. 177, 178.)

Give dates of observation of forty-six species of butterflies, up to July 7th, when the record was suspended.

Dates of collection of some New York Heterocera for the year 1872. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 179-184. Entomological Contributions — No. III, 1874, pp. 179-184.)

Of Sphingidæ, 16 species; Ægeridæ, Zyganidæ, and Bombycidæ, 18 species; Noctuidæ, 69 species; Phalaenidæ, 37 species — in all 140 species. Also, of 59 species taken in preceding years. Also, Notes on *Erastria carneola* Guen., *Camptogramma* [*Plemyria*] *fluviata* Hüb., and *Cryptolechia Schlagerei* Zeller.

Description of a Convenient Insect Case. (Twenty-sixth Report on the N. Y. State Museum of Natural History, 1874, pp. 185-188. Entomological Contributions—No. III, 1874, pp. 185-188, 3 figures.) Also in Fifth Report on the Insects of Missouri, 1873, pp. 38-40, fig. 21.

Describes the construction of a case with glass sides, on one of which pieces of cork are cemented for holding the insects—the whole to be bound in the form of a folio volume; also, of less expensive unbound cases.

[The above is also contained in Dr. Riley's "Directions for Collecting and Preserving Insects" (pp. 101-104), published by the Smithsonian Institution, in 1892.]

The Three-lined Leaf-Beetle. (Country Gentleman, for July 23, 1874, xxxix, p. 471, c. 1—17 cm.)

The insect, *Lema trilineata* (Oliv.), received from Clyde, N. Y., from potato vines, is described, its larval habits and transformations given, and the remedies for it.

[See notice in the *Second Report of the Insects of New York*, 1885, pp. 132-136, figs. 32, 33.]

The Soldier Bug. (Country Gentleman, for July 23, 1874, xxxix, p. 471, c. 1, 2—12 cm.)

*Arma spinosa* Dallas, sent from Carbon Cliff, Ill., is a valuable agent in the destruction of the Colorado potato-beetle.

[Published in the *Sixth Report on the Insects of New York*, 1890, p. 137, fig. 18, as *Podisus spinosus* (Dallas).]

A Timothy Eater. (Country Gentleman, for July 23, 1874, xxxix, p. 471, c. 2—9 cm.)

Notice of an unknown caterpillar feeding upon the heads of timothy at Jarrettown, Pennsylvania. They spun up in slight cocoons of pieces of grass and bits of wood, from which it is hoped to obtain the moth for identification.

[The moth was *Leucania* sp.? See, also, the *Country Gentleman* for August 6, p. 505, c. 1, where the caterpillar is reported as eating at the heart of corn, and on wheat.]

The Raspberry Borer. (Country Gentleman, for July 30, 1874, xxxix, p. 487, c. 1—15 cm.)

Description of *Oberea tripunctata* (Fabr.), found in Potsdam, N. Y., girdling the canes of the raspberry; of the manner in which the canes are ringed, the injury caused by it, and suggestions for the prevention of its increase.

[Extended in the *Fifth Report on the Insects of New York*, 1889, pp. 231-233, fig. 28— as *Oberea bimaculata* (Oliv.).]

Insect on the Potato. (Country Gentleman, for July 30, 1874, xxxix, p. 488, c. 1, 2—14 cm.)

Insects proving destructive to the potato vines in Sonyea, Livingston Co., N. Y., are identified as one of the true bugs, known as *Cosmopepla carnifera* (Fabr.). Beating from the vines, and exposing to poultry recommended. Habits of allied Hemipterous forms referred to, with difficulty attending their destruction.

[See the *Second Report on the Insects of New York*, 1885, pp. 144-148, fig. 36.]

The Joint-Worm. (Country Gentleman, for September 10, 1874, xxxix, p. 584, c. 1, 2—13 cm.)

Account is given of the galls and transformations of *Isosoma hordei* (Harris), with habits and history in brief, in reply to inquiries from Clarksville, N. J.

[See *Fourth Report on the Insects of New York*, 1888, pp. 27-35, figs. 10-14.]

*Cimex lectularius*. (Country Gentleman, for September 24, 1874, xxxix, p. 615, c. 4—26 cm.)

The literature, natural history, habits, etc., of the bed-bug given, and fumigation of infested rooms by brimstone recommended for its destruction in this instance where they infest books and papers in a library at Prairieville, Mo.

[Published also in the *Second Report on the Insects of New York*, 1885, pp. 16-18. The insect is now known as *Acanthia lectularia* (Linn.).]

The Maple Leaf Cutter. (Country Gentleman, for October 1, 1874, xxxix, p. 631, c. 1, 2—29 cm.)

Identification of *Orniva acerifoliella* Fitch, destroying maple forests in Pittsford, Vt., and notice of its operations and occasional multiplication; probabilities of its continuance in the future.

[Extended in the *Fifth Report on the Insects of New York*, 1889, pp. 215-219, figs. 22-24, under generic name of *Incurvaria*.]

The Cattle Tick. (Country Gentleman, for October 1, 1874, xxxix, p. 631, c. 2—14 cm.)

Appearance and habits of *Ixodes bovis* Riley, prevalent in Pennsylvania; its abundance at times, and notice of other species of the genus.

The Oil-Beetle. (Country Gentleman, for October 15, 1874, xxxix, p. 663, c. 4—10 cm.)

Notice of appearance, interesting habits and vesicating properties of *Meloe angusticollis* Say, received from Perry, N. Y., and where the insect is found.

[Published in *Sixth Report on the Insects of New York*, 1890, pp. 130, 131, fig. 15.]

Mr. Otto Meske's Collection of Lepidoptera. (Albany Evening Times, for October 27, 1874. Transactions of the Albany Institute, 1876, viii, pp. 215-220.)

Commended for its arrangement and preparation and perfection of its specimens: how the field collections were made: the labor devoted to its arrangement: Mr. Meske's devotion to the study: the rare Sphingidæ of the collection and full New York representation: abundance of Catocalas in North America: to insure thoroughness in entomology specialists are required.

Description of a New Species of Calocampa. (Bulletin of the Buffalo Society of Natural Sciences, ii, October, 1874, pp. 188, 189.)

*Calocampa nupera*, from localities in New York, hitherto regarded as identical with *C. vetusta* of Europe, is described as a new species.



(E)

CONTRIBUTIONS TO THE DEPARTMENT.

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The following are the Contributions that have been made to the Department during the year (1892):

HYMENOPTERA.

Examples (4) of *Augochlora* sp.? from a cavity in decayed wood, in November. From H. F. BASSETT, Waterbury, Conn.

Cocoon clusters of *Apanteles rufocoxalis* Riley, parasitic on larvæ of *Clisiocampa Americana*, Harris, May 29th. From JAMES ANGUS, West Farms, New York city.

Currant twigs containing larvæ of the girdler — believed to be *Janus flaviventris* Fitch. From J. F. ROSE, South Byron, N. Y.

*Bombus Pennsylvanicus* (De Geer), *Bombus* sp., *Xylocopa Virginica* (Drury), *Vespa maculata* Fabr., *Vespa* sp., *Odynerus capra* (Sauss.), and three other species undetermined. From Mrs. E. B. SMITH, Coeymans, N. Y.

Galls of species not determined on wild rose. From Prof. C. H. PECK, Albany, N. Y.

LEPIDOPTERA.

Larvæ of *Papilio Cresphontes* Cramer, from *Choisya ternata*. From WILLIAM FALCONER, Glen Cove, L. I., N. Y.

*Ancyloxypha Numitor* (Fabr.) and ten specimens of Heterocera From Mrs. E. B. SMITH, Coeymans, N. Y.

Larva of *Thyreus Abbotii* Swainson. From Mrs. H. SIMMONS, Albany, N. Y.

Larva of *Sphinx Celeus* (Hübner) parasitized by *Apanteles congregatus* Say — the imagoes emerging August 24th. From Mrs. ANTHONY VICTORIN, Watervliet Arsenal, N. Y.

Larvæ of *Podosesia syringæ* (Harris) boring in lilac. From JOHN L. LOCKWOOD, New York city.

*Phobetron pithecium* (Sm.-Abb.), spun up in its cocoon, August 28th. From IRA PEASE, Oswego, N. Y. The same, on *Cornus*, from Dr. T. C. ALDRICH, Tarrytown, N. Y. The same, on oak, September 5th, from Mrs. J. CARTER BROWN, East Greenwich, N. Y.

Larva of *Eucles imperialis* (Drury), August 23d. From RICHARD LEWIS, Crugers Island, Barrytown, N. Y.

Larvæ and pupæ of *Zeuzera pyrina* Linn. in elm. From E. B. SOUTHWICK, Central Park, New York City.

Larvæ and imago of *Plusia brassicæ* Riley, from a greenhouse, April 12th. From Rev. Dr. SAMUEL COX, L. I., N. Y.

Larvæ of the eye-spotted bud-moth, *Tmetocera ocellana* (Schiff.), in its winter dwelling on apple twigs. From JAMES FLETCHER, Dominion Entomologist, Ottawa, Canada.

*Tischeria malifoliella* Clemens — the larvæ in mines in apple leaves, September 22d. From Mr. McDougal, Schenectady, N. Y.

A Tineid, in numerous examples, from trunks of elms. From L. N. GILLIS, Albany, N. Y.

## DIPTERA.

*Tabanus sulcifrons* Macq., *Tabanus lineola* Fabr., *Chrysops niger* Macq., *Eristalis tenax* (Linn.) 5 and puparia 6, and a Trypetid and three Tipulidæ undetermined. From Mrs. E. B. SMITH, Coeymans, N. Y.

*Chrysopila thoracica* (Fabr.), *Eristalis Meigenii* (Wied.), *Eristalis tenax* (Linn.), and *Helophilus latifrons* Loew. From L. N. GILLIS, Albany, N. Y.

*Hystericia vivida* (Harris). From Hon. W. L. LEARNED, Albany, N. Y.

*Hamatobia serrata* R. Desv. From GEORGE S. FRENCH, Mexico, Oswego county, N. Y.

*Laucaniu flaviceps* Loew, April 4th, from birds' nests collected in the preceding autumn. From Dr. W. H. VANDENBERG, Fort Edward, N. Y.

## COLEOPTERA.

*Cicindela 6-guttata* Fabr., *Cicindela generosa* Dejean., *Silpha Americana* Linn., *Macroductylus subspinosus* (Fabr.), and *Desmocerus palliatus* (Forst.). From L. N. GILLIS, Albany, N. Y.

Larvæ of *Harpalus* sp? and ?*Anisodactylus* from roots of strawberry plants, October 22d. From H. VAN SLYKE, New Baltimore, N. Y.

*Dytiscus marginalis* Linn. (living, November 11th). From W. C. HITCHCOCK, Pittstown, N. Y.

*Silyanus Surinamensis* (Linn.) in crushed oats; larvæ and imagoes of *Dermestes murinus* Lec. From G. R. LUMSDEN, Greenville, Conn.

*Silyanus cassiæ* Reiche, and *Carpophilus pallipennis* (Say). From H. E. WEED, Agricultural College, Miss.

*Cis fulvipes* Mellié (of the Cioidæ), from the fungus *Polystictus versicolor*. From C. L. SHEAR, Glen, N. Y.

*Ellychnia corrusca* (Linn.), taken in numbers from the peony. From Mrs. H. D. GRAVES, Ausable Forks, N. Y.

*Chauliognathus Pennsylvanicus* (De Geer), feeding on pollen of roses and grapes, June 3d. From C. H. MOORE, Birds Nest, Va.

*Trox unistriatus* Beauv. From BERTHOLD FERNOW, New Paltz, N. Y.

*Luchnosterna tristis* (Fabr.), 63 examples. From J. S. SMART, Cambridge, N. Y.

*Euphoria Inda* (Linn.), feeding on ripe pears, August 30th. From T. G. AVERY, Buffalo, N. Y.

*Dynastes Tityus* (Linn.), taken from a ripe pear, October 4th. From F. W. EMMORD, Magnolia, Maryland.

*Monohammus confusor* (Kirby). From C. M. Reed, Sinclairville, N. Y.

*Paria aterrima* (Oliv.), 3 examples taken from strawberry roots in November. From H. F. BASSETT, Waterbury, Conn.

*Systema frontalis* (Fabr.), from gooseberry leaves in August; *Bruchus obsoletus* Say, taken alive from a glass case of beans put up in 1882. From Dr. PETER COLLIER, Agricultural Experiment Station, Geneva, N. Y.

*Bruchus obsoletus* Say. From GREENVILLE M. INGALSBE, Sandy Hill, N. Y.

*Tenebrio obscurus* Fabr., infesting wheat in a granary. From ROBERT L. REILLY, Buckland, Va.

*Tribolium ferrugineum* (Fabr.) in wheat middlings. From Dr. E. W. DORAN, College Park, Maryland.

*Epicauta Pennsylvanica* (De Geer) feeding on asters. From A. C. RICE, Meriden, Conn.

*Otiorhynchus ovatus* (Linn.) infesting a dwelling-house. From AUGUSTUS FLOYD, Moriches, N. Y.

*Lixus concavus* Say, and 10 other species of Coleoptera. From Mrs. E. B. SMITH, Coeymans, N. Y.

#### HEMIPTERA.

*Murgantia histrionica* (Hahn.) from cabbage, May 9th. From ISAAC A. GARSUM, Woodbury, N. J.

*Phymata Wolfii* Stal. From W. H. COLEMAN, Albany, N. Y.

*Myzus cerasi* (Fabr.) from ox-heart cherry. From Mrs. E. C. BRINKERHOFF, Nunda, N. Y.

*Callipterus castanea* Fitch—exuvia of the aphid on the under side of chestnut leaves. From VERPLANCK COLVIN, Albany, N. Y.

*Pemphigus tessellata* (Fitch), on alder, in association with the honey-dew fungus, *Scorius spongiosum*. From Miss FLORENCE B. HIMES, Albany, N. Y.

Galls of *Phylloxera vitifoliae* (Fitch). From EDWIN SLOCOMBE, Camillus, N. Y.

*Mytilaspis pomorum* Bouché, occurring on seventeen species of food-plants. From JOHN D. LYONS, Monticello, N. Y.

*Chionaspis furfurus* (Fitch) on apple. From T. O. ALLER, High Bridge, N. J.

#### ORTHOPTERA.

*Ecanthus niveus* (De Geer): *Amblycorypha oblongifolia* (De Geer) and *Melanoplus femur-rubrum* (De Geer). From Mrs. E. B. SMITH, Coeymans, N. Y.

Egg-deposit of *Ecanthus niveus* (De Geer) in an apple twig. From NORMAN POMROY, Lockport, N. Y.

*Chortophaga viridifasciata* (De Geer) — the larvæ taken on March 20th. From C. H. COY, Cossayuna, N. Y. The same, on April 18th. From E. H. KILMER, Canaan Four Corners, N. Y.

#### NEUROPTERA.

*Ephemera* sp.—larvæ of, taken from a water-filter. From G. C. HODGES, Utica Academy, Utica, N. Y.

*Plathemis trimaculata* (De Geer.) From L. N. GILLIS, Albany, N. Y.

*Thrips* sp. ?, infesting cabbage and cauliflower. From Mr. GARRAHEN, Kingston, Pa.

*Epeira insularis* Hentz, from heliotrope. From ROBERT LENOX BANKS, Jr., Albany, N. Y.

*Ixodes* sp. ? and *Rhipistoma Americana* MARX. From Mrs. GEORGE NOTMAN, Brooklyn, N. Y.

*Gamasus* sp. ? feeding on mushrooms. From WILLIAM FALCONER, Glen Cove, N. Y.

An Acariden infesting potatoes and thought to be the cause of the scab. From D. J. GARTH, Scarsdale, N. Y.

*Julus cœruleocinctus* Wood, in cavities in potatoes. From D. G. GARTH, Scarsdale, N. Y.

(F)

CLASSIFIED LIST OF INSECTS NOTICED IN THIS  
REPORT.

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HYMENOPTERA.

- Monostegia ignota (*Norton*), the strawberry slug.  
Eriocampa cerasi (*Peck*), the cherry-tree or pear-tree slug.

LEPIDOPTERA.

- Papilio Cresphontes *Cramer*, the yellow-banded swallow-tail.  
Podosesia syringæ (*Harris*), the Syringa borer.  
Ocneria dispar (*Linn.*), the Gypsy moth.  
Orgyia leucostigma (*Sm.-Abb.*), the white-marked tussock-moth.  
Dryocampa rubicunda (*Fabr.*), the rosy Dryocampa.  
Clisiocampa Americana *Harris*, the apple-tree tent-caterpillar.  
Zeuzera pyrina (*Fabr.*), the leopard moth.  
Plusia brassicæ *Riley*, the cabbage Plusia.  
Tmetocera ocellana (*Schiff.*), the eye-spotted bud-moth.  
Carpocapsa pomonella (*Linn.*), the codling-moth.  
Coleophora Fletcherella *Fern.*, the apple case-bearer.

DIPTERA.

- Pulex irritans *Linn.*, the common flea.  
Hæmatobia serrata *R. Desv.*, the cow-horn fly.  
Pollenia rudis (*Fabr.*), the cluster fly.  
Anthomyia brassicæ *Bouché*, the cabbage fly.  
Phytomyza chrysanthemi *Kowarz*, the Marguerite fly.

COLEOPTERA.

- Adalia bipunctata (*Linn.*), the two-spotted lady-bird.  
Attagenus picens (*Oliv.*), the black carpet beetle.  
Anthrenus scrophulariæ (*Fabr.*), the carpet beetle.  
Chauliognathus Pennsylvanicus (*De G.*), Pennsylvania soldier beetle.  
Macroductylus subspinosus (*Fabr.*), the rose-bug.  
Lachnosterna fusca (*Fröhl.*) and congeners, the white grubs.  
Lachnosterna tristis (*Fabr.*).  
Dynastes Tityus (*Linn.*), the Rhinoceros beetle.

- Allorhina nitida* (*Linn.*), the fig eater.  
*Elaphidion parallelum* *Newm.*, a maple tree pruner.  
*Saperda tridentata* *Oliv.*, the common elm-tree borer.  
*Crioceris asparagi* (*Linn.*), the asparagus beetle.  
*Doryphora decemlineata* (*Say*), the Colorado potato-beetle.  
*Diabrotica vittata* (*Fabr.*), the striped cucumber beetle.  
*Galerucella xanthomelæna* (*Schr.*) the elm-leaf beetle.  
*Systema frontalis* (*Fabr.*).  
*Tenebrio obscurus* *Fabr.*, the American meal-worm.  
*Otiorhynchus ovatus* (*Linn.*).  
*Pissodes strobi* (*Peck*), the white-pine weevil.  
*Anthonomus quadrigibbus* *Say*, the apple curculio.  
*Anthonomus musculus* *Say*, the strawberry weevil.  
*Conotrachelus nenuphar* (*Herbst*), the plum curculio.  
*Craponius inæqualis* (*Say*), the grape curculio.  
*Xyleborus pyri* (*Peck*), the pear-blight beetle.  
*Phlæotribus liminaris* (*Harr.*), the peach-bark Scolytus.

## HEMIPTERA.

- Murgantia histrionica* (*Hahn.*), the Harlequin cabbage-bug.  
*Typhlocyba vitis* (*Harris*), the grapevine leaf-hopper.  
*Psylla pyricola* *Foerster*, the pear-tree Psylla.  
*Myzus ribis* (*Linn.*), the currant aphid.  
*Myzus cerasi* (*Fabr.*), the cherry-tree aphid.  
*Aphis mali* *Fabr.*, the apple-tree aphid.  
*Aphis pruni* *Fabr.*, the plum-tree aphid.  
*Aphis Middletonii* *Thomas*, the aster-root aphid.  
*Pemphigus tessellata* (*Fitch*), the alder-blight aphid.  
*Phylloxera vitifoliæ* (*Fitch*), the grapevine Phylloxera.  
*Chionaspis pinifoliæ* (*Fitch*), the pine-leaf scale-insect.  
*Mytilaspis pomorum* (*Bouché*), the oyster-shell bark-louse.

## ORTHOPTERA.

- Chortophaga viridifasciata* (*De Geer*), the green-striped grasshopper.

## NEUROPTERA.

- Ephemera* sp. ?, a May-fly.

## ARACHNIDA.

- Tetranychus telarius* (*Linn.*), the red spider.

## MYRIAPODA.

- Thousand-legged worms.

## CRUSTACEA.

- Crangonyx mucronatus* *Forbes*, a fresh-water shrimp.

# GENERAL INDEX.

## A

- Abbotii, Otiocerus, 386.  
Thyreus, 451, 461.  
Abbot's Otiocerus, 386.  
abietis, Athysanus, 400.  
Lachnus, 407, 412.  
Abraxas [Eufichia] ribearia, 456.  
Acanthia lectularia, 458.  
Acariden infesting potatoes, 464.  
acerifoliella, Ornix, 458.  
aceris, Aphid, 406, 412.  
Chaitophorus, 411, 412.  
Acer Pennsylvanicum insect: Chaitophorus aceris, 406  
Acetate of copper, a fungus preventive, 420.  
achatina, Clastoptera, 393.  
Achemon, Philampelus, 451.  
Acocephalus vitellinus, 397.  
Acrididæ 330, 332  
Acronycta Americana, 455.  
funeralis, 455.  
morula, 455.  
oblinita, 456.  
Actias Luna, 455, 456.  
Acutalis dorsalis, 410.  
acutus, ?Jassus, 402.  
Platymetopius, 410.  
Adalia bipunctata, 306, 370.  
Address before the Albany Institute, 446.  
Address before the Association of Economic Entomologists at Champaign, Ill., 417.  
Address before the Conference of the Fruit and Vine Growers of New South Wales, Australia, 340.  
Address before the Ohio State Horticultural Society, 434.  
Addresses before the Western New York Horticultural Society, 414-421, 422-437,  
adjuncta, Hadenia [Mamestra], 456.  
advena, Silvanus, 308.  
Ægeridæ, 456.  
æroides, Plusia, 456,  
æsculi [pyrina], Zeuzera, 426.  
affinis, Erythroneura, 403.  
Typhlocyba, 410.  
Agrotis tricolor, 416.  
Alaus oculatus, 448.  
Albany Argus cited, 446(2).  
Albany Evening Journal cited, 348, 349.  
Albany Evening Times cited, 454(2), 459.  
albifrons, Edema, 456.  
Alder blight, 346-347, 408.  
Alder insects:  
Eriosoma [Pemphigus] tessellata, 408, 413.  
Lachnus alnifoliæ, 407.  
Pemphigus tessellata, 346, 411, 413, 463.  
Alder-leaf Lachnus, 407.  
Aldrich, T. C., insects from, 461.  
Aller, T. O., insects from, 464.  
Allerton, W. L., on Crangonyx, 349.  
Allorhina nitida, 353.  
alnifoliæ, Lachnus, 407, 412.  
Alnus rubra insect: Eriosoma [Pemphigus] tessellata, 408.  
alternatus, Idiocerus, 399.  
Alypia octomaculata, 455.  
Aunbycephalus Curtisii, 401.  
inimicus, 401-402.  
melsheimerii, 401.  
sayii, 401.  
Amblycorypha oblongifolia, 464.  
Americana Acronycta, 455.  
Clisiocampa, 298, 441, 456, 461.  
Empusa, 314.  
Euprepia, 452.  
Gastropacha, 456.  
Penthimia, 397.  
Silpha, 462.  
American Agriculturist cited, 321.  
Butterflies (Scudder) referred to, 448.  
Cultivator cited, 433.  
Cycloperia cited, 299.  
Entomologist cited, 300, 317, 349, 359.  
Journal of Science and Arts cited, 309.  
meal-worm, 307-309.  
Naturalist cited, 299, 300(2), 304, 307, 309, 311, 447, 448.  
ampelopsidis, Telamona, 391.  
Amphicerus bicaudatus, 447.  
Amphidasys [Eubya] cognataria, 456.  
Amsterdam Daily Democrat cited, 299.  
Amyot and Serville's Histoire Naturelle des Insectes—Hémiptères cited, 384.  
Anasa tristis, 434.  
Ancyloxypha Numitor, 461.  
Angus, J., insects from, 461.  
angusticollis, Meloe, 458.  
Animal collections eaten by Attagenus piceus, 304.  
Anisodactylus, 462.  
Anisopteryx vernata, 296, 422.  
Anisota senatoria, 470, 453.  
annulata, Psylla, 404, 411.

- Anotia bonnetii*, 387.  
*Anthomyia brassicae*, 431.  
*Anthonomus musculus*, 431.  
     *quadrigibbus*, 419.  
     *signatus*, 431.  
*Anthrenus*, 381.  
*Anthrenus flavipes*, 290, 301.  
     *lepidus*, 299, 305.  
     *scrophulariae*, 299-306.  
     *thoracicus*, 299, 301.  
 Ant-lion, 454.  
 Ants, 370, 371, 441, 454.  
*Apanteles congregatus*, 461.  
     *rufocoxalis*, 461.  
*Apatelodes Angelica*, 455.  
 Aphidæ (of Fitch catalogue), 405.  
*Aphides*, 319, 321, 346, 370, 371, 372, 432, 441.  
     kerosene for killing, 431, 432.  
     soap suds for killing, 432.  
 Aphididæ, 319, 381.  
     revision of species of Fitch catalogue, 411-413.  
 Aphidinae, 411.  
*Aphis aceris* [*Chaitophorus aceris*], 406, 411, 412.  
     *asclepiadis* [*Siphonophora asclepiadis*], 405, 411.  
     *berberidis* [*Rhopalosiphum berberidis*], 405, 411, 412.  
     *betulæcolens* [*Callipterus betulæcolens*], 406, 411, 412.  
     *brassicæ*, 405, 412, 440.  
     *cerasicolens*, 405, 411, 412.  
     *cerasifoliae*, 411.  
     *cerasi* [*Myzus cerasi*], 405, 411, 412.  
     *cornifoliae*, 405, 412.  
     *cratægifoliae*, 406, 412.  
     "lanata," 320.  
     *lanigera* [*Schizoneura lanigera*], 407, 411, 412.  
     *mali*, 293, 373, 405, 412, 431.  
     *malifoliae*, 412.  
     *Middletonii*, 371, 441.  
     *pinicolens*, 406, 412.  
     *populifoliae* [*Chaitophorus populifoliae*], 406, 411, 412.  
     *pruni*, 369.  
     *rudbeckiae* [*Siphonophora rudbeckiae*], 406, 411, 412.  
     *rumicis*, 440.  
     *saubucifoliae*, 406, 412.\*  
*Aphodius fimetarius*, 440.  
*Aphrophora parallela*, 410.  
     *quadrinotata*, 392.  
     *saratogensis*, 410.  
 Apple curculio destructive in the Western states, 419.  
 Apple insects:  
     *Alaus oculatus*, 448.  
     *Amphicerus bicaudatus*, 447.  
     *Anthonomus quadrigibbus*, 419.  
     *Aphis mali*, 293, 373, 405, 431-432.  
     *Bucculatrix pomifoliella*, 445.  
     *Cacœcia argyrosplila*, 374.  
     *Carpocapsa pomonella*, 296, 338-342, 422.  
     *Chionaspis furfurus*, 440, 464.  
     *Clisiocampa Americana*, 441.  
     *Coccus arborum-linearis* (see *Mytilaspis pomorum*).  
     *Colophora Fletcherella*, 374.  
     *Eiaphidion parallelum*, 358-359.  
     *Macroactylus sub-spinosus*, 420.  
     *Monarthrum mali*, 440.  
     *Mytilaspis pomorum*, 373, 411.  
     *Myzoxylus mali* = *Schizoneura lanigera*, 407.  
     *Oecanthus niveus*, 464.  
     *Peniphigus pyri*, 411, 413.  
     *Psylla mali*, 323.  
     *Psylla pyri*, 323.  
     *Psylla pyrisuga*, 323.  
     *Saperda candida*, 440.  
     *Schizoneura lanigera*, 411, 412.  
     *Tischeria malifoliella*, 445, 462.  
     *Tmetocera ocellana*, 296, 373, 462.  
     *Zeuzera pyrina*, 426.  
 apple-leaf miner, *Tischeria*, 445.  
 Apple-root blight, 405.  
 Apple scab, spraying for, 435.  
 Apple-tree aphid, 373, 405, 434.  
     bark-beetle, 410.  
     bark-louse, 373.  
     blight, 407.  
     *Bucculatrix*, 445.  
     insects, 372-374.  
     tent-caterpillar, 436-437, 441.  
 Apple-twig borer on pear trees, 447.  
 Apple-worm, 296, 332, 344, 422.  
 Apricot, *Carpocapsa pomonella* attacking, 340.  
 Arachnida, 466.  
*Archasia galeata*, 410.  
*Aretia Arge*, 455.  
*Aretica*, *Mamestra*, 447.  
*Arge*, *Arctia*, 455.  
*argyrosplila*, *Cacœcia*, 374.  
*Arna spinosa* [*Podisus spinosus*], 457.  
 Army-worm, 413.  
*Arphia sulphurea*, 330.  
*arquata*, *Carynota*, 388.  
     *Vanduzeei*, 410.  
 Arsenical spraying, 297, 336, 340, 343, 345, 372, 373, 374, 415, 416, 417, 425, 431.  
 Arsenites with Bordeaux mixture, 435.  
 Arsenites with lime, 416.

\*In consideration of the labor that it would involve, the indication in this index of the synonymy of the species listed in the Fitch Catalogue of Homoptera (as given in *Aphis* species), will not be continued, as the accepted nomenclature may readily be found through the page references.

- arvensis, Delphax, 386.  
 Liburnia, 410.  
 Ascaris lumbricoides, 298.  
 asclepiadis, Aphis, 405-411.  
 Siphonophora, 411.  
 Asellus crustacean, 349.  
 stygius, 348.  
 Ash: insects injurious to,  
 Dynastes Tityus, 342.  
 Papilio Cresphontes, 337.  
 Podosesia syringæ, 338.  
 Ashmead [W. H.] cited, 317.  
 asparagi, Crioceris, 342-343.  
 Asparagus beetle, 342-343.  
 Aster and lily pests, 371-372.  
 asteroides, Cucullia, 455.  
 Asters: insects attacking,  
 Aphis Middletonii, 371, 441.  
 Epicauta Pennsylvanica, 463.  
 Atalanta, Pyrameis, 454.  
 aterrima, Paria, 463.  
 Athysanus [species referred to Bythoscopus].  
 abietis, 400.  
 Curtisi, 410.  
 fagi, 401.  
 fenestratus, 400.  
 minor, 400.  
 nigrinasi, 401.  
 variabilis, 400.  
 atlantis, Melanoplus, 332.  
 Atlantes, 290.  
 Atomizer, Woodason, 415.  
 atra, Clastoptera, 394.  
 atramentaria, Pollenia, 313.  
 atrata, Rhyssa [Thalassa], 454.  
 Attac on pease, An unrecognized, 368.  
 Attagenus dichrous = piceus, 300.  
 megatoma = piceus, 302, 303.  
 piceus, 299-306.  
 rufipennis = piceus, 300.  
 spurcus = piceus, 300.  
 Atwater, Director of the Office of Experiment  
 Stations quoted, 414.  
 Atymna castaneæ, 410.  
 quercu, 410.  
 Augochlora species, 461.  
 Aulacizes mollipes, 396.  
 noveboracensis, 395.  
 Aulacomerus lutescens [= Cladius viminalis],  
 439.  
 auriculata, Smilia, 389.  
 Ausonius, Nisoniades, 449.  
 Austrian pines diseased, 376-378.  
 avenæ, Siphonophora, 294.  
 Avery, T. G., insects from, 463.
- B**
- Babbitt's Continental Washing powder as an  
 insecticide, 434.  
 Babbitt's 1776 soap powder as an insecticide,  
 434.  
 Bagging grapes for preventing insect attack, 364.  
 Bag-worm, 440.  
 Bailey, Prof. [L. H.] on a new bush nozzle, 415.  
 on solubility of London purple, 415.  
 balluca, Plusia, 456.  
 Balsam Cecidomyia, 440.  
 balsamicola, Cecidomyia, 440.  
 Banded Cœlidia, 398.  
 Banded Telamona, 390.  
 Banding with burlaps for Ocneria caterpillars,  
 424, 425.  
 Banks, Jr., R. L., Epelra from, 464.  
 Bark-borer, 365, 367.  
 Bark-louse, 440, 447.  
 Barnard, Dr. [W. S.] cited, 317, 322.  
 basillaris, Erythroneura, 403.  
 Bassett, H. F., insects from, 461, 463.  
 Beans: insects injurious to,  
 Bruchus obsoletus, 440, 463.  
 rufimanus, 440.  
 Diabrotica vittata, 364.  
 Systema blanda, 344.  
 Bean weevil, 421-410.  
 Beckwith, M. H., on spraying for the codling-  
 moth, 417.  
 Beech: insects injurious to,  
 Athysanus fagi, 401.  
 Cœlidia subbifasciata [Jassus olitorius]  
 398, 410.  
 Elaphidion villosum, 358-359.  
 Eriosoma [Schizoneura] imbricator, 408.  
 Jassus olitorius, 410.  
 Otiocerus coquebertii, 396.  
 Telamona fagi [Heliria scalaris], 391, 410.  
 Beet-leaf miners, 375.  
 Beets: insects injurious to,  
 Lygus pratensis, 375.  
 Phyllotreta vittata, 375.  
 Systema blanda, 344, 375.  
 Benzine, application of, 304.  
 berberidis, Aphis, 405.  
 Rhopalosiphum, 411, 412.  
 Berberry Aphis, 405.  
 Bernard, D. L., cited, 356.  
 betulæcolens, Aphis, 406, 412.  
 Callipterus, 411, 412.  
 Beutenmuller [Wm.] cited, 300, 301, 307.  
 bicaudatus, Amphicerus, 447.  
 bifida, Tettigonia, 395.  
 bimaculata, Oberea, 457.  
 Thelia, 392.  
 binotata, Enchenopa, 410.  
 binotatum, Enochophyllum, 387.  
 bipunctata, Adalia, 306, 370.  
 Birch: insects injurious to,  
 Aphis betulæcolens, 406.  
 Athysanus fenestratus, 400.  
 minor, 400.  
 variabilis, 400.  
 Bythoscopus seminudus, 398.  
 Elaphidion villosum, 358-359.  
 Birds' nests, Lauxania flaviceps from, 462.  
 Bisulphide of carbon, 308, 363, 427, 439, 442, 443.

- Black-and-red woolly bear, 439-440.  
 Black ants, 370.  
 Blackberry, Insects Injurious to, cited, 430.  
 Black blister beetle, 443.  
 Black carpet beetle, *Attagenus megatoma*:  
   abundance, 303.  
   a dangerous museum pest, 304.  
   bibliography and synonymy, 300.  
   description of the beetle, 303.  
   detected as a carpet pest, 302.  
   feather felting by, 304.  
   figures of, 303.  
   larval features, 302.  
   remedies for, 304.  
   woolen, cotton, linen, etc., eaten by it, 304.  
 Black-winged Grapta, 446.  
 blanda, *Systena*, 344, 375.  
 Blatchley [W. S.] cited, 330, 331.  
 Blight in asters, 372.  
 Blind craw-fish, 348.  
 Blind shrimp in wells, 347-349.  
 Bombus *Pennsylvanicus*, 461.  
   species? 461.  
 Bombycidae, 453, 455(3), 456.  
 Bombycid moth, 426, 443  
 Bone dust as a remedy, 363.  
 bonnetii, *Anotia*, 3-7.  
 Books and papers infested by *Acanthia lectularia*, 458.  
 Bordeaux mixture, 416, 417, 420, 433, 434, 435.  
   with Paris green, 434.  
 borealis, *Cerura*, 456.  
   *Epilachna*, 440.  
 Boston Journal cited, 300.  
 Bounties for insect pests, 436-437.  
 bovis, *Ixodes*, 458.  
 brassicae, *Anthomyia*, 431.  
   *Aphis*, 405, 412, 440.  
   *Plusia*, 296, 422, 462.  
 Brinkernoff, Mrs. E. C., insects from, 463.  
   on cherry-tree aphid, 345.  
 Brown, Mrs. J. C., insect from, 461.  
 Brown rot, 417.  
 Brown rot and the plum-tree aphid, 368-369.  
 Bruchus *lenticis*, 440.  
   *obsoletus*, 440, 463(2).  
   *pisii*, 439.  
   *rufimanus*, 440.  
 Bruner, L., cited, 376.  
   on distribution of *Chortophaga viridifasciata* 333.  
 Bryobia *pratensis*, 440.  
 Bryocrypta *hamamelidis*, 409, 412.  
 bubalus, *Ceresa*, 390.  
 Bucculatrix *pomifoliella*, 445.  
 Bud-worm, 372, 373.  
 Buffalo-bug, 302.  
 Buffalo *Ceresa*, 390.  
 Buffaloensis, *Sesia* [*Hemaris*], 451.  
 Buffalo fly, 444.  
 Bulletin of the Brooklyn Entomological Society cited, 307, 338.
- Bulletin — (*Continued*):  
 Buffalo (Society of Natural Sciences cited, 459).  
 Cornell University Agricultural Experiment Station cited, 318, 326, 374, 415, 429-430, 433, 435, 436.  
 Delaware Agricultural Experiment Station cited, 417, 430, 436.  
 Geological and Geographical Survey of the Territories cited, 299.  
 Illinois Museum of Natural History cited, 348.  
 Iowa Agricultural Experiment Station cited, 415, 431, 435.  
 Massachusetts Agricultural Hatch Experiment Station cited, 300(2), 318, 417, 436.  
 Michigan Agricultural Experiment Station cited, 436.  
 Minnesota Geological and Natural History Survey cited, 371.  
 Mississippi Agricultural Experiment Station cited, 317.  
 Nebraska Agricultural Experiment Station cited, 295, 376.  
 New Jersey Agricultural Experiment Station cited, 430, 436.  
 New Mexico Agricultural Experiment Station cited, 430(?).  
 New York State Museum of Natural History cited, 356, 357.  
 North Carolina Agricultural Experiment Station cited, 435.  
 Ohio Agricultural Experiment Station cited, 345, 417, 433, 436.  
 Oregon Agricultural Experiment Station cited, 430.  
 Pennsylvania Agricultural Experiment Station cited, 436.  
 South Dakota Agricultural Experiment Station cited, 432.  
 United States Department of Agriculture cited, 436.  
 Bulletins on Spraying and Insecticides cited, 436.  
 Bunker [R.] cited, 337.  
 Burdock infusion, 362.  
 Burning rubbish, 316, 441.  
 Bush nozzle, 415.  
 Butterflies, 336, 449, 453, 456.  
   Calendar of, for 1869 cited, 449.  
   List of New York, cited, 449.  
 Butternut, *Carynota mera* on, 388.  
 Byrrhus, 299.  
 Bythoscopus *clitellarius*, 398.  
   *fenestratus*, 410.  
   *minor*, 410.  
   *nigrinasi*, 410.  
   *seminudus*, 398.  
   *species*, 410.  
   *strobi*, 398.  
   *tergatus*, 398.  
   *unicolor*, 398.  
   *variabilis*, 410.

## C

- Cabbage aphid, 405, 432, 440.  
butterfly, 446, 447, 451.  
caterpillar, 422.  
fly, 431.
- Cabbage: insects injurious to,  
  *Anthomyia brassicæ*, 431, 432.  
  Aphid brassicæ, 405, 440.  
  *Murgantia histrionica*, 315, 441, 463.  
  *Plusia brassicæ*, 295.  
  Thrips, 415, 464.
- Cabbage maggot, 418, 431.  
  *Plusia*, 296.  
  worm, 444, 446.
- Cacœcia argyrosipila*, 374.  
  rosaceana, 418.
- Cæcidotea stygia*, 349.
- caja, *Euprepia*, 452.
- Calandra granaria*, 308.  
  oryzæ, 308.  
  remotepunctata, 308.
- calcitrans, *Stomoxys*, 444.
- Calendars of Butterflies for the years 1869 and  
  1870, summary of contents, 449, 453.
- Callimorpha Lecontei*, 455.
- Callipterinae, 412.
- Callipterus betulæcolens*, 411, 412.  
  castaneæ, 463.
- Callosamia Promethea*, 455.
- Calocampa nupera*, 459.  
  vetusta, 459.
- Caloptenus spretus*, 332.
- Camphor for the carpet beetle, 305.
- Campylogramma [Plemyria] fluviata*, 456.
- Campylenchia curvata*, 410.
- Canadian Entomologist cited, 300, 304, 307, 317,  
  318(3), 330, 361, 454.
- candida, *Saperda*, 410.
- canicularis, *Cicada*, 385.
- Canker-worm, 296, 422.
- Cantaloupe, *Systema elongata* attacking, 344.
- capra, *Odynerus*, 461.
- Carbolated lime, 420.
- Carbolic acid, 363, 365, 418, 441.  
  with oils, 442.  
  with Paris green, 428.
- carneola, *Erastria*, 456.
- carnifex, *Cosmopepla*, 458.
- Carpet beetle, *Anthrenus scrophulariæ*, 300-  
  306.  
  bibliography and synonymy, 300.  
  destructive in Pennsylvania in 1863, 305.  
  features of, 301, 302.  
  figures of, 301.  
  habits of the larva, 305.  
  houses may be freed from it, 305.  
  ignorance respecting, 302.  
  known often as the buffalo-bug, 302.  
  lady-bug mistaken for it, 306.  
  probable date of introduction, 305.  
  ravages first noticed, 305.  
  remedies, 304-305.
- Carpet beetle — (Continued) :  
  two-spotted *Adalia* compared with it, 306.  
  varieties named and figured, 301.
- Carpet beetles, 299-306.
- Carpet-bugs, 302, 303.
- Carpets: insects injurious to,  
  *Anthrenus scrophulariæ*, 302, 303, 305.  
  *Attagenus piceus*, 302-303.
- carpini, *Psylla*, 404, 411.
- Carpocapsa pomonella*, 296, 338-342, 422.
- Carpophilus pallipennis*, 462.
- caryæ, *Microcentrus*, 410.  
  *Uroxiphus*, 392.
- Carynota arquata*, 388.  
  marmorata, 410.  
  mera, 388.
- Case-worm, 374.
- cassie, *Silvanus*, 308, 462.
- Cassino's Standard Natural History cited, 300,  
  330.
- castaneæ, *Atymna*, 410.  
  *Callipterus*, 463.  
  *Smilia*, 389.
- Catalogue of the Diptera of North America  
  (Osten Sacken) cited, 309.
- Catalogue of the Insects of New Jersey  
  (Smith) cited, 215.
- Catalogue of the known Homoptera of the  
  State of New York (Fitch) 1851, 381-409.
- Castile soap in an insecticide, 444.
- catenaria, *Zerene*, 450.
- Catocala parta*, 456.  
  species?, 455.
- Catocalas*, abundance of, in North America,  
  459.
- Cattle tick, 458.
- Cauliflower: insects injurious to,  
  *Anthomyia brassicæ*, 431.  
  *Pieris rapæ*, 442.  
  Thrips sp.? 464.
- C- aureum, *Grapta*, 446.
- Caustic potash as an insecticide, 444.
- Cecidomyia balsamicola*, 440.  
  species?, 440.
- Cecropia*, *Platysamia*, 455.
- Celeus*, *Sphinx*, 461.
- Ceramica [Mamestra] picta*, 455.
- cerasi, *Aphis*, 405, 412.  
  *Eriocampa*, 335, 336, 440.  
  Myzus 293, 345-346, 369, 411, 412, 440, 463.  
  *Selandria*, 335.
- cerasicolens, *Aphis*, 405, 411, 412.
- cerasifoliae, *Aphis*, 411, 412.
- Cerasus insects:  
  *Aphis cerasicolens*, 405.  
  cerasi, 405.
- cerealella, *Sitotroga*, 308.
- Ceresa bubalus*, 390.  
  diceros, 390.
- cerintha, *Chamyris*, 456.
- Cerisyi*, *Smerinthus*, 451.
- Cermatia forceps*, 440.
- Cerura borealis*, 456.

- Chaltophorus aceris*, 411, 412.  
   *populi*, 411, 412.  
   *populifoliae*, 411, 412.  
*Chamyris cerlatha*, 456.  
 ?*Chariclea exprimens*, 456.  
 Charlton, J., on asparagus beetle, 343.  
*Chauliognathus Pennsylvanicus*, 344, 463.  
 Cheap insecticide, 434-435.  
*Chelone glabra*, food plant of *Melitæa Phaëton*, 448.  
*Chermes pinicorticis*, 454.  
 Cherry-tree aphid, *Myzus cerasi*, 293, 345, 346, 405, 440.  
   figures of different stages, plate 6, opp. p. 346.  
   introduced from Europe, 346.  
   life-history worked out by Prof. Weed, 346.  
   not confined to the garden cherry, 346.  
   occurs also on plum trees, 346, 440.  
   remedies, 345, 369  
   severe attack in Nunda, N. Y., 345.  
 Cherry: insects injurious to,  
   *Aphis cerasi*, 405.  
     *cerasicolens*, 405.  
   *Carpocapsa pomonella*, 340.  
   *Eriocampa cerasi*, 335.  
   *Macroductylus subspinosus*, 420.  
   *Myzus cerasi*, 293, 345-346, 369, 463.  
 Cherry-tree or pear-tree slug, *Eriocampa cerasi*, 335-336.  
   deposit of the eggs, 335.  
   figures of the larva and saw fly, 335.  
   fruit trees attacked by it, 335.  
   injuries reported from Orange N. J., 335.  
   Prof. Peck's prize pamphlet, 335.  
   remedies, 336.  
   two broods each year, 336.  
   what the insect is, 335.  
 Chestnuts: insects attacking,  
   *Callipterus castaneæ*, 463.  
   *Elaphidion villosum*, 358-359.  
   *Smilia castaneæ*, 389.  
     *inornata*, 388.  
     *Telamona reclinata*, 391.  
*Chimarocephala viridifasciata*, 330, 439.  
 Chinch-bug, 312.  
*Chionaspis furfurus*, 440-441, 464.  
   *pinifoliae*, 377.  
   *salicis*, 411.  
 Chittenden, F. H., on *Anthonomus signatus*, 431.  
*chloris*, *Parasa*, 443.  
*Chlorotettix tergatus*, 410.  
   *unicolor*, 410.  
*Chloropisca prolifica*, 440.  
*Chlorops prolifica*, 313.  
   *species*, 313.  
*Choisya ternata*, *Papilio Cresphontes* attacking, 336, 461.  
*Chortophaga infuscata*, 332, 334.  
   *viridifasciata*, 298, 330-334, 439, 464.  
*chrysanthemii*, *Phytomyza*, 421.  
*Chrysanthemum*: *Phytomyza chrysanthemii* injurious to, 421.  
*Chrysomelid flea-beetle*, 297.  
*Chrysopila thoracica*, 462.  
*Chrysops niger*, 462.  
*Cicada canicularis*, 385.  
   *pruinosa*, 385.  
   *rimosa*, 385.  
   *septendecim*, 385, 440.  
   *tibicen*, 410.  
*Cicadas*, 319, 385.  
*Cicadidae*, 385.  
*Cicindela generosa*, 462.  
   *6-guttata*, 462.  
*Cimex lectularius*, 458.  
*cincticollis*, *Clastoptera*, 394.  
*Cineraria*, *Phytomyza chrysanthemii* on, 421.  
*Cis fulvipes*, 462.  
*Citrus*, *Papilio cresphontes* attacking, 337.  
*Cixius impunctatus*, 386.  
   *pini*, 385.  
   *quinquelineatus*, 386.  
   *stigmatus*, 385.  
 Clark, Mary E., on *Anthrenus scrophulariæ*, 305.  
 Clarkson, F., cited, 361.  
 Classification of Insects (Westwood) cited, 307.  
*Clastoptera achatiua*, 393.  
   *atra*, 394.  
   *cincticollis*, 394.  
   *flavicollis*, 394.  
   *maculicollis*, 394.  
   *nigricollis*, 395.  
   *obtusa*, 393.  
   *pini*, 393-394, 410.  
   *proteus*, 394.  
   *testacea*, 393.  
*clavata*, *Deloyala* [*Coptocycla*], 454.  
*Cleora pulcherrima*, 450.  
 Climbing Ant-lion, 440.  
*clitellarius*, *Thamnotettix*, 410.  
 Clover mite, *Bryobia pratensis*, 440.  
 Cluster-fly, *Pollenia rudis*, 309-314, 439.  
   an introduced species, 309.  
   bibliography, 309.  
   clustering habit in rooms, 310.  
   Dall's observations on, 311.  
   described a century ago, 309.  
   description by Dr. Harris, 313-314.  
   early stages, 313.  
   entrance in dwellings and departure, 312.  
   figures, 309, 310.  
   general features, 310.  
   habits, 310, 311.  
   killed by a fungus, 314.  
   limited literature, 311.  
   nuisance in houses, 311, 312.  
   numerous European representatives, 310.  
   other diptera hibernating in houses, 313.  
   remedies, 314.  
   Riley's study of, 311.  
   spring appearance, 312.

- Cluster-fly — (*Continued*):  
 the genus *Pollenia*, 310.  
 when introduced, not known, 309.  
 where observed in numbers, 311-312.
- Coal soot for the cucumber beetle, 303.
- Coccidæ, 381, 385, 409, 411, 413, 447.
- coccinea, *Diedrocephala*, 410.  
*Empoa*, 403.  
*Typhlocyba*, 410.
- Cocculus indicus* berries, 352.
- Coccus arborum-linearis*, 409, 413.  
*pinicorticis*, 454.  
*salicis*, 409, 411, 413.  
 species, 447.  
*tiliæ*, 409, 413.
- Cochliopodæ, 443.
- Cocoon of *Cucullia convexipennis*, 450.  
*Cucullia intermedia*, 450.  
*Hemileuca Maia*, 448.  
*Lagoa crispata*, 452.  
*Leucania* sp., 457.  
*Sesia Buffaloensis*, 451.  
*Tischeria malifoliella*, 445.
- Codling-moth, *Carpocapsa pomonella*, 338-342.  
 a new form of larval feeding, 339.  
 Beckwith's experiments on, 417.  
 eggs sometimes on side of apple, 340, 341.  
 Howard's account of the insect, 341.  
 killed by *Chauliognathus*, 344.  
 Munson's observations on the larvæ, 341-342.  
 operates differently in Tasmania, 339.  
 ordinary method of larval burrowing, 339.  
 promiscuous placing of the eggs, 339.  
 results of spraying for, 433, 435.  
 scarcity of, 296.  
 where the larva enters the fruit, 340-342.  
 various fruits attacked in Tasmania, 340.
- Coe, A. J., cited, 326.
- Coe Brothers, pear-tree *Psylla* in orchards of, 325, 326.
- Cœlidia olitoria*, 398.  
*subbifasciata*, 398.
- Cœlodasys* [*Schizura*] *unicornis*, 455.  
*cœruleocinctus*, *Julus*, 464.  
*cognataria*, *Amphidasys* [*Eubyia*], 456.
- Coleman, W. H., insects from, 463.
- Coleophora Fletcherella*, 374.  
 species, 374.
- Coleoptera, 299, 307, 354, 465-466.
- Cole [Theodore A.], pear-tree *Psylla* in orchard of, 324.
- Collecting egg belts of the tent-caterpillar, 437, 441, 444.
- Collier, Dr. P., insects from, 347, 353, 463.
- Colorado potato-beetle, 297, 422, 457.  
 remedy for, 297.  
 damage, 297.
- Colvin, V., insects from, 463.
- Common house fly, 310, 313, 375.
- Common White Grubs (Forbes) cited, 354.  
*communis*, *Helochara*, 396, 410.
- Compositæ, *Phytomyza chrysanthemi* attacking, 421.
- Comstock [Prof. J. H.] cited, 317, 330, 332, 346-347.
- concava, *Entilia*, 387.  
*Telamona*, 390.
- concaus, *Lixus*, 463
- concinna, *Notodonta*, 454.
- Cone-flower, *Aphis rudbeckiæ* on, 406.
- confusor, *Monohammus*, 463.
- congregatus, *Apanteles*, 461.
- coniferarum, *Ellema*, 449.
- Conotrachelus nenuphar*, 297, 422, 440.
- Conover, G. S., cited, 343.
- convexipennis, *Cucullia*, 450, 455.
- Cook, Prof. A. J. cited, 325.
- Copper compounds, 436.  
 hydrate 416.  
 solutions, 417, 420.
- coquebertii, *Otiocerus*, 386.
- Coquillet [D. W.] cited, 334.
- Corn grubs, 353.
- cornifoliæ, *Aphis*, 405, 412
- Corn: insects injurious to,  
*Gortyna* species, 447.  
*Mamestra Arctica*, 447.  
*Systema blanda*, 344  
 white grubs, 356.
- Corn meal for killing cabbage worms, 444
- Cornus paniculata* insects:  
*Aphis cornifoliæ*, 405.  
*Clastoptera proteus*, 394.
- Cornus*, *Phobetrion pithecium* attacking, 461.
- coryli*, *Telamona*, 391, 410.
- Cosmopepla carnifex*, 458.
- Cossus robiniæ*, 426.
- Cotton fabrics, *Attagenus piceus* recorded as eating, 304.
- Cotton plant, *Systema frontalis* injurious to, 344.
- Cotton-worm, 344.
- Country Gentleman cited, 299(6), 300, 307, 309, 316, 318(2), 321, 323(2), 330(2), 336, 357, 362, 364, 366, 372, 374, 377, 378, 434, 439(3), 440(3), 441(4), 442(6), 443(7), 444(5), 446, 447(7), 448.
- Cow-horn fly, articles cited, 442, 444.  
 distribution of the, 296.
- Cox, Rev. S., insects from, 462.  
 quoted, 296.
- Coy, C. H., insects from, 464.
- Crangonyx gracilis*, 348.  
*mucronatus*, 347-349.
- Craponius inæqualis*, 364-265.  
*cratægifoliæ*, *Aphis*, 406, 412.  
*cratægi*, *Thelia*, 392.
- Cratægus punctata*, *Aphis cratægifoliæ* on, 406.
- Creosote oil as an insecticide, 454.
- Cresphontes, *Papilio*, 236-337, 461.
- Cres-y, W. N. cited, 340.
- Crioceris asparagi*, 342-343.
- crispata*, *Lagoa*, 452.

- Cruciferae: insects feeding on,  
*Murgantia histrionica*, 441.  
*Phyllotreta vittata*, 375.
- Crustacea, 466.
- Crustacea in wells, 347-349.
- Cryptolechia Schlegleri*, 456.
- Ctenucha virginica*, 456.
- cucurbitae, *Melittia*, 434.
- Cucullia asteroides*, 455.  
*convexipennis*, 450, 455.  
*florea*, 456.  
*intermedia*, 450.  
*lucifuga*, 450.  
*serraticornis*, 456.  
*Speyeri*, 456.
- Cultivator cited, 320.
- cunea*, *Hyphantria*, 295, 422.
- Curculionid beetle, 297, 345.
- Currant aphid, *Myzus ribis*, 370-371.  
 black ants as protectors, 376.  
 controlled by the two-spotted lady bug, 370.  
 honey-dew excretions, 370.  
 occasional prodigious multiplication, 370.  
 operations of, 370.  
 parasites attack it, 370.  
 remedies, 370.  
 Vermorel nozzle to be used in spraying, 370.
- Currant: insects injurious to,  
*Janus flaviventris*, 461.  
*Myzus cerasi*, 346.  
*ribis*, 370.
- Curtis, Dr. J. cited, 307.
- curtisii*, *Amblycephalus*, 401.  
*Athysanus*, 410.
- curvata*, *Campylenchia*, 410.
- Cut-worms in corn, 446, 447.
- Cyrtolobus fenestratus*, 410.  
*inornatus*, 410.  
*vau*, 410.
- Cyrtosia fenestrata*, 389.  
*marmorata*, 389.
- D**
- Dall, Mrs. C. H. cited, 309.
- Dall, W. H. cited, 311, 439.
- Darapsa Myron*, 450.
- Daremma undulosa*, 452.
- Dates of Collection of New York Heterocera,  
 450, 456.
- Day flies, 298.
- decemlineata*, *Doryphora*, 297, 422.
- degeerii*, *Otiocerus*, 386.
- Deilephila lineata*, 451.
- Deloyala* [*Ooptocycla*] *clavata*, 454.
- Delphax arvensis*, 386.  
*dorsalis*, 386.
- Deltocephalus inimicus*, 410.  
*Melsheimerii*, 410  
*Sayii*, 410
- Dendroleon obsoletum*, 440.
- Depressaria heracliana*, 454.  
*Ontariella*, 454.
- celis*, *Diphthera*, 456.
- Dermestes megatoma*, 300.  
*murinus*, 462.  
*piceus*, 300.
- Dermestida*, 299, 303.
- Description of a convenient insect case, 457.
- Desmocerus palliatus*, 462.
- Destructive shade-tree pest, 426-427.
- Desvoidy, R. cited, 309, 310, 311, 313.
- Diabrotica* *12-punctata*, 440.  
*vittata*, 361.
- dicerus*, *Ceresa*, 390.
- dichrous*, *Attagenus*, 300.
- Dickinson, J. H., paper read by, 340.
- Dictamnus fraxiuella*, *Papilio Cresphontes* on,  
 336.
- Diedrocephala coccinea*, 410.  
*mcllipes*, 410.  
*novaboracensis*, 410.
- Diervilla trifida*, *Hemaris diffinis* on, 451.  
*diffinis*, *Sesia*, 450.
- Dimmock, Dr. G. cited, 300.
- Diplosis pyrivora*, 318, 441.
- Diptera, 309, 313, 462, 465.
- Diphthera deridens*, 456.
- Directions for Collecting and Preserving Insects (Riley) cited, 457.
- Diseased Austrian pines, 376-378.
- dispar*, *Ocneria*, 423-426, 440.
- dispar*, *Xyleborus*, 366, 419.
- Dog-day Cicada, 385.
- Dogwood: insects attacking,  
*Aphis cornifoliae*, 405.  
*Clastoptera proteus*, 394.  
*Evscanthus orbitalis*, 397.  
*Tettigonia tripunctata*, 395.
- domestica*, *Musca*, 300.
- Doran, Dr. E. W., insects from, 463.
- dorsalis*, *Acutalis*, 410.  
*Delphax*, 386.  
*Stenocranus*, 410.  
*Tragopa*, 392.
- Doryphora decemlineata*, 297, 422.
- Downing's Horticulturist cited, 367.
- Dried plants, *Attagenus piceus* feeds on, 304.
- Dryocampa imperialis*, 447.  
*rubicunda*, 425, 422, 455.
- Dung-beetle, 440.
- Dutcher, J. B., maple-tree pruner from grounds of, 357.
- Dwelling-houses infested by *Otiiorhynchus ovatus*, 463.
- Dynastes Tityus*, 342, 440, 444, 463.
- Dytiscus marginalis*, 462.
- E**
- Eacles imperialis*, 462.
- Economic Entomology, 454.
- Edema albifrons*, 456.
- Edwards, W. H., cited, 446(?)
- Effect of London purple on the plum, 414-415.

- Eggs killed by kerosene emulsion, 329, 369.  
 Eggs of apple-tree tent-caterpillar, 427, 444.  
 asparagus beetle, 313.  
 cluster fly, 313.  
 codling-moth, 339, 340, 341.  
 Crioceris asparagi, 343.  
 Eacles imperialis, 453  
 Elaphidion parallelum, 359, 360.  
 Euprepia Americana, 452.  
 Feniseca Tarquinius, 346.  
 Gypsy moth, 423, 424, 425.  
 harlequin cabbage-bug, 315.  
 Hemileuca Maia, 448  
 Lagoa crispata, 452.  
 Melitæa Phaëton, 448.  
 Nisoniades Icelus, 449.  
 Orgyia leucostigma, 427  
 pear-tree Psylla, 327, 328, 329.  
 pear-tree slug, 335.  
 Philampelus Achemon, 451.  
 Pieris oleracea, 449.  
 Pollenia rudis, 313.  
 Sesia Buffaloensis, 451.  
 Smerinthus geminatus, 451.  
 white-pine weevil, 345.  
 egle, Euchætes, 452.  
 eight-lineata, Tettigonia, 397.  
 Elaphidion attack on maples, 359.  
 parallelum, 357-361.  
 villosum, 358, 359.  
 Elder leaf, Aphis sambucifoliæ on, 406.  
 Ellema coniferarum, 449.  
 Hariisii, 449.  
 pinastri, 449.  
 pineum, 449.  
 Ellychnia corrusca, 463.  
 Elm-bark beetle, 367.  
 Elm: insects injurious to,  
 Galerucella luteola, 297.  
 xanthomelaena, 297.  
 Lachnus ulmi, 457.  
 Orgyia leucostigma, 295, 429, 437.  
 Saperda tridentata, 427-428, 429.  
 Tineid sp., 462.  
 Zeuzera pyrina, 426, 427, 428, 462.  
 Elm-leaf beetle, 297, 422, 429.  
 Elm tree bark-borer, 427-429.  
 elongata, Systena, 344.  
 Emmord, F. H., insects from, 342, 463.  
 on Dynastes Tityus, 342.  
 Empoa coccinea, 403.  
 genus, 410.  
 querci, 403.  
 Empoasca fabæ, 410.  
 Empretia stimulea, 455.  
 Empusa Americana, 314.  
 muscæ, 314.  
 Enchenopa binotata, 410.  
 Euphophyllum binotatum, 387.  
 latipes, 387.  
 Encyclopedie Methodique: Histoire Naturelle  
 des Animaux (Olivier) cited, 300.  
 Ennomos magnaria, 456.  
 Entilia concava, 387.  
 sinuata, 387.  
 Entomologica Americana cited, 338.  
 Systematica (Fabricus) cited, 307, 309, 392,  
 405(2).  
 Entomological Contributions (Lintner) cited,  
 299, 300, 448(3), 449(6), 450(4), 451(4), 452(5),  
 453(5), 455(5), 456(4), 457.  
 Entomological Correspondence (Harris) cited,  
 309.  
 Entomological Notes (Scudder) cited, 330.  
 Entomologist cited, 300.  
 Entomology for Beginners (Packard) cited, 317.  
 Epeira insularis, 464.  
 ephemeraformis, Thyridopteryx, 440.  
 Ephemera sp., 293, 464.  
 Epicauta Pennsylvanica, 443, 463.  
 Epilachna borealis, 440  
 Epilobium coloratum, Eudryas unio feeding  
 on, 455.  
 epimenis, Psycomorpha, 455.  
 Erastria carneola, 456.  
 Erebus odora, 440.  
 Eriocampa cerasi, 335-336, 440.  
 Eriosoma fagi, 408.  
 imbricator, 408, 412.  
 lanigera, 407.  
 pyri, 408, 413.  
 strobi, 409, 412.  
 tessellata, 408, 413.  
 Eristalis Meignii, 462.  
 tenax, 462(2).  
 Erythroneura affinis, 403.  
 basillaris, 403.  
 fabæ, 403.  
 obliqua, 403.  
 tricineta, 403.  
 vitis, 403.  
 vulnerata, 402-403.  
 Euchætes collaris, 455.  
 egle, 452.  
 Oregonensis, 455.  
 Eudryas unio, 450, 455.  
 Eupatoriums: Phytomyza chrysanthemi on,  
 421.  
 Euphoria Inda, 442, 463.  
 Euprepia Americana, 452.  
 caja, 452.  
 European bean-weevil, 440.  
 Eutettix(?) seminudus, 410.  
 Evacanthus orbitalis, 397.  
 Evergestis straminealis, 456.  
 exitiosa, Sannina, 367.  
 Experience with the rose-bug (Smith), 419.  
 Experiments by Dr. C. M. Weed on the plum  
 weevil and cucumber beetle, 362, 363, 417, 419,  
 Experiments by M. H. Beckwith in codling-  
 moth spraying, 417.  
 Experiment Station publications, 429-436.  
 Experiments with Paris green on tent-cater-  
 pillars, 432.  
 exprimens, ?Chariclea, 456.  
 Eye-spotted bud-moth, 293, 296, 440, 462.

## F

- fabæ, Empoasca, 410.  
 Erythroneura, 403.  
 fagi, Athysanus, 401.  
 Eriosoma, 408.  
 Telamona, 391  
 Falconer, Wm. cited, 337.  
 insects from, 336, 461, 464.  
 Fall tent-caterpillar, 295, 422  
 familiaris, Musca, 309, 310, 313.  
 Farmers' bulletin on spraying, 436.  
 Farm Insects (Curtis) cited, 307.  
 fasciata, Telamona, 390, 410.  
 fasciola, Lthacodes [Limacodes], 456.  
 Feather-felting by Attagenus piceus, 304.  
 femoralis, L'via, 404, 411.  
 femoratum, Spectrum, 446.  
 femur-rubrum, Melanoplus, 297, 332, 464.  
 Fencing out insects, 363.  
 fenestrata, Bythoscopus, 410.  
 Cyrtosia, 389.  
 fenestratus, Athysanus, 400.  
 Cyrtolobus, 410.  
 Feniseca Tarquinius, 346.  
 Fernald [Prof. C. H.] cited, 300, 330, 374.  
 on kerosene emulsion for the red spider  
 and rose aphid, 432.  
 on Paris green on tent-caterpillars, 432.  
 on the gypsy moth, 423.  
 Fernow, Berthold, insects from, 463.  
 ferrugineum, Tribolium, 308, 463.  
 Figure of  
 Adalia bipunctata, 306.  
 Anthrenus flavipes, 301  
 Anthrenus scrophulariæ, 301.  
 Anthrenus thoracicus, 301.  
 asparagus beetle 343.  
 Attagenus piceus, 303.  
 Chauliognathus Pennsylvanicus, 344.  
 cherry-tree slug, 335.  
 Chortophaga viridifasciata, 331.  
 cluster fly, 309  
 Craponius inæqualis, 265.  
 Crioceris asparagi, 343.  
 egg of pear-tree Psylla, 328.  
 Eriocampa cerasi, 335.  
 galls of Phylloxera vitifoliae, 347.  
 grape curculio, 365.  
 green-striped locust, 331.  
 infested cucumber root, 362.  
 larva of Chauliognathus Pennsylvanicus,  
 344.  
 Craponius inæqualis, 365.  
 Diabrotica vittata, 362.  
 Eriocampa cerasi, 335.  
 grape curculio, 365.  
 Papilio Cresphontes, 337.  
 Pennsylvania soldier-beetle, 344.  
 Pissodes strobi, 344.  
 striped cucumber beetle, 362.  
 Tenebrio obscurus, 308.  
 Figure of larva of—(Continued):  
 white-pine weevil, 344  
 meal-worm, 308.  
 Pennsylvania soldier-beetle, 344.  
 Pissodes strobi, 344.  
 Pollenia rudis, 309.  
 pupa of meal-worm, 308.  
 pear-tree Psylla, 327.  
 Pissodes strobi, 344.  
 Psylla pyricola, 327.  
 Tenebrio obscurus, 308.  
 white-pine weevil, 344.  
 Tenebrio obscurus, 308.  
 thousand-legged worm, 372.  
 two-spotted lady-bird, 306.  
 white-pine weevil, 344.  
 filamentaria, Nematocampa, 456.  
 fimetarius, Aphodius, 440.  
 Fir: Cixius pini attacking, 365.  
 Fisher [Dr. Jab z] cited, 318, 325.  
 Fitch, Dr. A., Catalogue of the Known Homop-  
 tera of New York in 1851, by, 381-409.  
 cited, 317, 345(2).  
 on Elaphidion parallelum, 359, 360, 361.  
 quoted, 346, 367.  
 flaviceps, Lauxania, 462.  
 flavicollis, Clastoptera, 294.  
 flavilineata, Gypona, 397.  
 flavipes, Anthrenus, 299, 301.  
 Termes, 454.  
 flaviventris, Janus, 461.  
 Flea beetles, 375.  
 Fleas in a cellar, 352.  
 remedies for, 352-353.  
 Fletcheralla, Coleophora, 374.  
 Fletcher, J insects from, 462.  
 florea, Cucullia, 456.  
 Floyd, A., insects from, 463.  
 fluviata, Camptogramma [Plemyria], 456.  
 Foerster [Arnold] cited, 317, 322.  
 Forbes, Prof. S. A. cited, 342, 354, 356.  
 on a blind crustacean, 343.  
 quoted, 348, 354, 355.  
 Forbush, E. H. on Gypsy moth, 424.  
 on Gypsy moth insecticides, 434.  
 forceps, Cermatia, 440.  
 Force pumps, 339, 370.  
 Four-lined Psylla, 404.  
 Four-spotted Aphrophora, 392.  
 Four-striped Proconia, 395-396.  
 Fraxinella: Papilio Cresphontes attacking, 336.  
 French, G. S., insects from, 462.  
 Fresh-water shrimp, 348.  
 frontalis, Systena, 297, 343-344, 422, 463.  
 Frosted cicada, 385.  
 Pœciloptera, 357.  
 fulvicollis. Scepis, 456.  
 fulvidorsum, Jas-us, 402.  
 Phlepsius, 410.  
 fulvipes, Cis, 462.  
 funeralis, Acronycta, 455.

- Fungicides and insecticides**, 436.  
     bulletins on, 436.  
     combined with arsenites, 416-417.  
     copper solutions, 417.  
**Fungous diseases**, spraying for, 436.  
**Fungous pests**, 436.  
**Fungus attack on plums**, 368, 369.  
     on Austrian pines, 377.  
     *Pollenia rudis* killed by a, 314.  
     *Polystictus*, *Cis fulvipes* from, 462.  
     preventive of brown rot, 417.  
     *Scorias spongiosum* fed by honey-dew, 463.  
*furcilla*, *Platyserura*, 450, 455.  
*furfurus*, *Chionaspis*, 440-441, 464.  
**Furs attacked by *Attagenus piceus***, 304.  
*fusca*, *Lachnosterna*, 296, 353, 354, 422.
- G**
- galeata*, *Archasia*, 410.  
*Galerucella luteola*, 297.  
     *xanthomelæna*, 297, 422.  
**Gall-mites**, 377, 442.  
*Gamasus* species?, 464.  
**Gammaridæ**, 348.  
**Garden and Forest cited**, 318, 363, 436.  
**Gardeners' Chronicle and Agricultural Gazette**  
     cited, 428.  
**Gardening cited**, 431.  
**Gargara**, 388.  
**Garman's paper on Clastoptera genera, etc.**,  
     cited, 384.  
**Garrahen, Mr.**, insects from, 464.  
**Garscum, I. A.**, insects from, 463.  
**Garth, D. G.**, insects from, 464(2).  
**Gasoline as an insecticide**, 352.  
*Gastropacha Americana*, 456.  
**Gathering and burning egg-clusters**, 423-424.  
**Gauze covered frames for protecting from**  
     cucumber-beetle, 363.  
*geminatus*, *Snerinthus*, 451.  
*generosa*, *Cicindela*, 462.  
**Genet, E. J.** on the pear-tree *Psylla*, 320.  
**Geneva Courier** cited, 343.  
*gibbosa*, *Lachnosterna*, 355.  
     *Nadata*, 450, 456.  
**Gillette, C. P.**, experiments with London  
     purple, 415.  
     on fungicides with arsenites, 416.  
     on lime combined with arsenites, 416, 435.  
     on the apple *curculio*, 419.  
**Gillis, L. N.**, insects from, 462(3), 464.  
**Gissler, C. F.**, cited, 307(2).  
*globosus*, *Microdon*, 313.  
**Glover [Townend] cited**, 317.  
*Glycobius speciosus*, 442.  
**Goff, E. S.**, insects from, 343.  
     on protection from cabbage maggot, 431.  
**Golden rod: *Bythoscopus unicolor* on**, 398.  
**Gold, T. S.** on pear-tree *Psylla*, 325.  
**"Gold dust" soap-powder as an insecticide**, 434.  
*Gonopteryx libatrix*, 450.  
**Gooseberry: *Systema frontalis* attacking**, 297,  
     343, 422, 463.
- Gordius**, 298.  
**Gortyna species**, 447.  
*gracilis*, *Crangonyx*, 348.  
**Grain insects (in store):**  
     *Calandra granaria*, 308.  
         *oryzæ*, 308  
         *remotepunctata*, 308.  
     *Silvanus advena*, 308.  
         *cassia*, 308.  
         *Surinamensis*, 308.  
     *Sitotroga cerealella*, 308.  
     *Tenebrio molitor*, 308.  
         *obscurus*, 307.  
     *Tribolium ferrugineum*, 308.  
**granaria**, *Calandra*, 308.  
**Grape-berry moth**, 364.  
**Grape curculio**, *Craponius inæqualis*, 364, 365.  
     a western species, mainly, 364.  
     bagging the grapes as a preventive, 364.  
     features of the beetle, 365.  
     figures of larva and beetle, 365.  
     indications of attack, 364.  
     jarring for the beetle, 366.  
     nature of the injury, 364.  
     not injurious in New York, 364.  
     pupation, 365.  
     reference to writings on it, 365.  
**Grape: insects injurious to**,  
     *Aphrophora quadrinotata*, 392.  
     *Chaulignathus Pennsylvanicus*, 344, 463.  
     *Craponius inæqualis*, 364.  
     *Erythroneura vulnerata*, 403.  
     *Otiocerus coquebertii*, 386.  
     *Phylloxera vitifoliae*, 347.  
     *Tragopa dorsalis*, 392.  
     *Typhlocyba vitis*, 430.  
         white grubs, 354.  
**Grapevine *Erythroneura***, 403,  
     leaf-hopper, 430.  
     *Phylloxera*, 347.  
**Grapta C-aureum**, 446.  
     *interrogationis*, 446.  
     *umbrosa*, 446.  
**Grasshoppers**, 297, 298, 330, 333, 350, 439.  
**Grass: insects injurious to**,  
     *Amblycephalus curtisii*, 401.  
         *inimicus*, 401.  
         *melsheimerii*, 401.  
         *sayii*, 401.  
     *Aulacizes mollipes*, 396.  
     *noveboracensis*, 396.  
     *Chimarocephala viridifasciata*, 439.  
     *Chortophaga viridifasciata*, 331, 333.  
     *Helochara communis*, 396.  
     *Melanoplus fenur-rubrum*, 297.  
     *Tettigonia bifida*, 395.  
         white grubs, 354.  
**Graves, Mrs. H. D.**, insects from, 463.  
**Green-striped locust**, 298, 330-334, 439.  
     a double-brooded species, 333.  
     alarm caused by its early appearance, 332.  
     appearances in midwinter, 330, 331.  
     bibliography and synonymy, 330.

- Green-striped locust** — (*Continued*) :  
 distribution quite extensive, 333-334.  
 figures of larva and imago, 331.  
 generic names, 330.  
 millions seen in winter, 331.  
 not a grasshopper, but a locust, 333.  
 transformations 332.  
 two forms of the insect, 331-332.
- Green-striped maple worm**, 422.
- Green, W. J.**, address by, 434.
- Gregory, B. W.**, infested pease from, 363.
- Guide to the Study of Insects (Packard)** cited, 317, 360.
- guttata, Smilia**, 389.
- Gypona flavilineata**, 397.  
*scarlatina*, 397.  
*striata*, 410.
- Gypsum for the cucumber beetle**, 363.
- Gypsy moth**, 422-426.  
 a first-class insect pest, 422.  
 appropriations for its extermination, 423  
 as a pest, 424.  
 caterpillars not killed by Paris green, 432,  
 433.  
 eggs collected and burned, 424.  
 introduction, 423.  
 means used for its destruction, 423, 424.  
 number of infested trees treated, 424.  
 spread, 423.  
 work of the Commission, 423-425.
- H**
- Hadena [Mamestra] adjuncta**, 456.  
*lignicolor*, 456.
- Hæmatobia serrata**, 296, 442, 444, 462.
- Hagen, Dr. H. A.**, cited, 300, 304(2), 305.
- Hag-moth caterpillar**, 443
- Hair-cloth furniture: Attagenus piceus** found  
 in, 303.
- Hair eaten by Attagenus piceus**, 304.
- Hair-snake**, 298.
- Haldeman, Dr.** cited, 359.
- Halisidota caryæ**, 455.
- hamamelidis, Brysocrypta**, 409, 412.
- Hamilton, Dr. J.** cited, 300.
- Hand-power strawsonizer**, 418.
- Harlequin cabbage bug, Murgantia histrionica**,  
 315-317.  
 arsenite powerless against it, 316.  
 distribution in the United States, 315.  
 figures of different stages, 315.  
 fondness for mustard and radish, 316.  
 hibernates in the perfect stage, 315, 316.  
 importance of arresting its progress, 316.  
 new remedy proposed by Mr. Weed, 316.  
 northward progress, 315.  
 occurrence in New Jersey, 315.  
 rapid development, 315.  
 remedies, 316-317.  
 successive broods, 315.  
 traps and baits available, 316.
- Harpalus** species, 462.
- harpya [domestica], Musca**, 314.
- Harris, Dr. [T. W.]** cited, 309, 317, 319, 330, 332,  
 360, 367, 384.  
 description of pear-tree Psylla, 321.  
 of *Pollenia rudis*, 310.  
*Musca domestica* described as *M. harpyla*,  
 310.  
 on the apple worm, 339.  
 on the pear-tree Psylla, 320, 321, 325.
- Harrisii, Ellema**, 449.
- Hazelnut: insects attacking**,  
*Telamona coryli*, 391.  
*tristis*, 391.
- Helianthus divaricatus, Melitæa Nycteis** feed-  
 ing on, 448
- Heliotrope: Plusia brassicæ** on, 296.
- Heliria scalaris**, 410.
- Hellebore**, 316, 431, 440.  
 and water, 372.
- Helochara communis**, 396, 410.
- Helophilus latifrons**, 440, 462.
- Hemaris Buffaloënsis**, 451.  
*diffinis*, 451.
- Hemileuca Maia**, notices of, cited, 448, 456.
- Hemiptera**, 315, 317, 325, 333, 389, 463, 466.
- Hemlock: Pissodes strobil** attacking, 345.
- hemorrhoea, Penthimia**, 397.
- Henshaw, Samuel**, cited, 300.
- heracliana, Depressaria**, 454.
- Hessian fly**, 426, 447.
- Heterocera**, 450, 453, 456, 461.
- Heteroptera**, 315.
- Hickory insects:**  
*Elaphidion villosum*, 359.  
*Smilia inornata*, 388.
- Hides attacked by Attagenus piceus**, 304.
- Himes, Miss F. B.**, honey-dew fungus from, 347,  
 463.
- Hippiscus tuberculatus**, 330.
- hirticula, Lachnoosterna**, 355.
- Histoire Naturelle des Diptères des environs de**  
*Paris (Desvoidy)* cited, 309.
- Histoire Naturelle des Insectes — Diptères**  
*(Macquart)* cited, 309.
- Histoire Naturelle des Insectes — Hémiptères**  
*(Amyot and Serville)* cited, 384.
- histrionica, Murgantia**, 315-317, 441, 463.
- Hitchcock, W. C.**, insects from, 462.
- Hodges, Prof. G. C.**, insects from, 298, 464.
- Homoptera**, 317, 319, 381, 384.
- Honey-dew**, 347, 370, 371.
- Honey-dew fungus, Scorias spongiosum**, 463.
- Honeysuckle bush: Hemaris diffinis** on, 451.
- Hop-tree: Papilio Cresphontes** on, 337.
- Hop-vine aphid, Phorodon humuli**, 294, 369.
- hordei, Isosoma**, 458.
- Hormaphis hamamelidis**, 411, 412.
- Hornbeam: insects occurring on:**  
*Athysanus nigrinasi*, 401.  
*Jassus? acutus*, 402.  
*Psylla carpini*, 404.
- Horn, Dr. G. H.** quoted, 304, 364.

- Horse-chestnut: insects injurious to,  
*Orgyia leucostigma*, 295, 437.  
*Zeuzera pyrina*, 426
- Hot water as an insecticide, 310, 372, 441.
- Household centipede, 440.
- House-infesting beetle, 422.
- Howard, L. O. cited, 340.
- Hubbard, H. G. quoted, 349, 359.
- Hulst, Rev. Mr. on the syringa borer, 338.
- humuli, *Phorodon*, 294, 369.
- Hydrocyanic acid gas, 352.
- Hylesinus opaculus*, 367.
- Hypena scabra*, 454.
- hyperborea, *Platartia*, 452.
- Hyperchiria Io, reference to described transformations, 452.  
*varia*, 453.
- Hyphantria cunea*, 295, 422.
- Hystriella vivida*, 462.
- I
- Icelus*, *Nisoniades*, 440.
- Ichthyura inclusa*, 450.  
*vau*, 455.
- Idiocerus* genus, 396.
- Idiocerus alternatus*, 399,  
*lachrymalis*, 398-399.  
*maculipennis*, 399.  
*pallidus*, 399.  
*suturalis*, 399.
- ignota, *Monostegia*, 431.
- Illiger's Magazine cited, 407.
- imbricator, *Eriosoma*, 408, 412.
- imbricator, *Schizoneura*, 411, 412.
- immaculatus, *Myrmeleon*, 440.
- imperialis, *Dryocampa*, 447.  
*Eacles*, 462.
- implicita, *Lachnosterna*, 355.
- impunctatus, *Cixius*, 386.  
*Myndus*, 410.
- inæqualis, *Craponius*, 364-365.
- inclusa, *Ichthyura*, 450.
- Incurvaria acerifoliella*, 458.
- Inda, *Euphoria*, 442, 463.
- Indian Cetoulan, 449.
- inermis, *Smilia*, 388.  
*Stictocephala*, 410.
- infuscata, *Chortophaga*, 332, 334.
- Ingalsbe, G. M., insects from, 463.
- inimicus, *Amblycephalus*, 401-402.  
*Deltocephalus*, 410.
- Injurious Insects (Harris) cited, 391, 392, 395, 403(2).
- inornata, *Smilia*, 388.
- inornatus, *Cyrtolobus*, 410.
- Insect Enemies of the Sugar Beet, 376.
- Insecticide machine, 417-418.
- Insecticides, 417, 418, 419, 432-436.  
bulletins on, 436.  
contact, 434.  
fungicides and, 436.  
lately recommended, 418.  
machine for distribution of, 417-418.
- Insectivorous Birds, reference to, 349-351.  
*Accipiter Cooperi*, 351.  
black-blacks, 350, 351.  
*Bubo Virginianus*, 351.  
crane, 350.  
crow, 350, 351.  
crow-blackbird, 350.  
English sparrow, 350, 351.  
hawk, 350, 351.  
king-fisher, 350, 351.  
meadow lark, 350, 351.  
owl, 350, 351.  
*Passer domesticus*, 351.  
raven, 350, 351.  
robin, 350, 351.  
shrike, 350.
- Insect Life cited, 297, 300(2), 301(2), 309(2), 314, 317(2), 318(2), 344(3), 349, 353, 356, 365, 418, 419(2), 426, 431, 433.
- Insect lime, or raupenleim, 425.
- Insects Injurious to the Blackberry, notice of Bulletin on, 430.
- Insects Injurious to Forest and Shade Trees (Packard) cited, 345, 359, 428.
- Insects Injurious to Fruits (Saunders) cited, 317, 365, 367.
- Insects Injurious to Vegetation (Harris) cited, 317, 321, 360, 367.
- Insects Injurious to Young Fruit Trees, Bulletin cited, 420.
- Insects of New England (Harris) cited, 391, 380.
- Insects introduced from Europe:  
cabbage butterfly, 446.  
carpet beetle, 304.  
cluster-fly, 309.  
codling-moth, 340.  
cow-horn fly, 296.  
*Euprepia caja*, 452.  
Gypsy moth, 423.  
Marguerite fly, 419.  
meal-worm, 308.  
*Musca rudis*, 309.  
pear-blight beetle, 419.  
pear midge, 318.  
pear-tree *Psylla*, 318, 322.  
*Pieris rapæ*, 446.  
*Pteromalus puparum*, 447.  
*Xyleborus dispar*, 419.  
*Zeuzera pyrina*, 426.
- Insects received from New York localities:  
Albany, 446, 461(2), 462(4), 463(3), 464(2).  
Athens, 323.  
Ausable Forks, 463.  
Barrytown, 462.  
Brooklyn, 464.  
Buffalo, 443, 463.  
Cambridge, 296, 463.  
Camillus, 317, 464.  
Canaan Four Corners, 330, 332, 464.  
Carlton, 442.  
Cheviot-on-Hudson, 442.

## Insects received from — (Continued) :

- Clyde, 445, 457.  
 Coeymans, 461(2), 462, 463, 464.  
 Columbia County, 298, 330, 332.  
 Fort Edward, 462.  
 Geneva, 311, 443, 463.  
 Glen Cove, L. I., 323, 336, 461, 462, 464.  
 Lockport, 464.  
 Long Island, 462.  
 Malcom, 338.  
 Mastic, Moriches, 377.  
 Matteawan, 376.  
 Menands, 322.  
 Monticello, 464.  
 Moriches, L. I., 297, 463.  
 Newark, 353.  
 New Baltimore, 462,  
 New Paltz, 463.  
 New York City, 338, 359, 461(2), 462.  
 Nunda, 463.  
 Oswego, 347, 373, 461, 462.  
 Palenville, 312.  
 Pawling, 357.  
 Pen Yan, 365.  
 Pittstown, 462.  
 Potsdam, 457.  
 Poughkeepsie, 302,  
 Queens county, 447.  
 Rochester, 374.  
 Sandy Hill, 463.  
 Scarsdale, 464(2).  
 Schenectady, 462.  
 Schoharie, 368, 449.  
 Sinclairville, 463.  
 Sonyea, 458.  
 South Byron, 461.  
 Tarrytown, 461.  
 Unadilla, 370.  
 Utica, 298, 464.  
 Watervliet, 461.  
 Wayne county, 333.

## Insects received from other localities:

- Agricultural College, Miss., 462.  
 Birds' Nest, Va., 344, 463.  
 Buckland, Va., 307, 442, 463.  
 Carbon Cliff, Ill., 457.  
 Clarksboro, N. J., 458.  
 College Park, Md., 463.  
 Columbia, Miss., 445.  
 Cos Cob, Conn., 443.  
 East Greenwich, R. I., 443.  
 Franklin county, Ohio, 447.  
 Greenville, Conn., 462.  
 High Fridge, N. J., 440, 464.  
 Kingston, Pa., 445, 464.  
 Kentucky, 440.  
 Magnolia, Md., 342, 444, 463.  
 McGregor, Iowa, 360.  
 Meriden, Conn., 443, 463.  
 New Jersey, 315.  
 Ottawa, Canada, 462.  
 Pittsford, Vt., 458.

## Insects received from other localities—(Cont'd) :

- Sanford, Tenn., 364.  
 Washington, D. C., 354.  
 Waterbury, Conn., 461, 463.  
 Windsor, Canada, 447.  
 Woodbury, N. J., 315, 441, 463.  
*insularis*, Epeira, 464.  
*intermedia*, Cucullia, 450.  
*interrogationis*, Grapta, 446.  
 Intestinal worm, 293.  
 Introduction to Entomology (Comstock) cited,  
 317, 320, 346.  
 Introduction to the Modern Classification of  
 Insects (Westwood) cited, 307.  
*inversa*, Lachnosterna, 355.  
 Io, Hyperchiria, 45, 453.  
*irroratus*, Jassus, 402.  
*irroratus*, Phlepsius, 410.  
 Irus, Thecla, 449.  
*isabella*, Pyrrharctia, 439.  
*I-osoma hordei*, 458.  
*Ixodes bovis*, 458.  
 species ? 464.

## J

- Jamaicensis*, Smerinthus, 451.  
*Janus flaviventris*, 461.  
 Jarring for the curculio, 365.  
 Jassides, 396, 402.  
 Jassus genus, 400, 401.  
*Jassus acutus*, 402.  
     *fulvidorsum*, 402.  
     *irroratus*, 402.  
     *olitorius*, 410.  
     *verticis*, 410.  
 Jayne [Dr. H. F.] cited, 300, 303.  
 Johnson's Natural History cited, 299.  
 Joint-worm, 458.  
 Journal of the Academy of Natural Sciences  
 cited, 385(3), 386, 387, 388(4), 389, 392, 393(2),  
 395(2), 396, 398(4), 401, 402(2).  
 Journal of the Microscopical Society cited, 307.  
 Journal of the New York Microscopical Society  
 cited, 300, 301.  
*Julus cœruleocinctus*, 464.

## K

- Kellicott, Dr. cited, 338.  
 Kerosene, 304, 316-317, 329, 366, 372, 423, 424, 425,  
 430, 431, 434, 442, 444.  
 Ker-sene emulsion, 316, 329, 345, 353-354, 362,  
 369(3), 373, 374, 375, 420, 428, 430(2), 431, 432,  
 436, 440, 441, 444.  
 Kilgore, B. W., a cheap insecticide by, 434-  
 435.  
 Kilmer, E. H., insects from, 464.  
*kirbyii*, Otiocerus, 386.  
 Kollar cited, 426.

## L

- Lachninae*, 412.  
*Lachnosterna*, 373, 354, 355.  
     *fusca*, 366, 353, 354, 355, 356, 422.  
     *gibbosa*, 355.

- Lachnosterna* — (*Continued*):  
*hirticula*, 355.  
*implicita*, 355.  
*inversa*, 355.  
*rugosa*, 355.  
*tristis*, 296, 463.
- lachrymalis*, *Idiocerus*, 398-399.
- Lady-bug, 302, 306.
- Lagoa crispata*, 452
- Lamarck: *Histoire Naturelle des Animaux sans Vertébrés* cited, 299.
- Lamina vulgaris*, 410.
- Lampyridæ, 344.
- lanigera*, *Aphis*, 412.  
*Eriosoma*, 407.  
*Schizoneura*, 411, 412.
- Larva of  
*Alypia octomaculata*, 455.  
*Anisota senatoria*, 453.  
*Anthrenus scrophulariæ*, 302.  
*Attageus piceus*, 302.  
*Carpocapsa pomonella*, 338, 339.  
*Chaulognathus Pennsylvanicus*, 344.  
*Craponius inæqualis*, 364, 365.  
*Cucullia convexipennis*, 450.  
*intermedia*, 450.  
*Daremma undulosa*, 452.  
*Diabrotica vittata*, 362.  
*Eacles imperialis*, 453.  
*Elaphidion parallelum*, 358, 359, 360.  
*Eriocampa cerasi*, 335, 336.  
*Euchætes egle*, 452.  
*Eudryas unio*, 455.  
*Euprepia Americana*, 452.  
*Gypsy moth*, 423, 424, 425.  
*Hyperchiria Io*, 453.  
*Lachnosterna*, 353, 354, 355, 356.  
*Lagoa crispata*, 453.  
*Murgantia histrionica*, 315.  
*Papilio Cresphontes*, 337.  
*Pennsylvania soldier-beetle*, 344.  
*Pieris oleracea*, 449.  
*Pissodes strobis*, 344.  
*Platarctia Parthenos*, 452.  
*Pollenia rudis*, 313.  
*Psycomorpha epimenis*, 455.  
*Psylla pyricola*, 319.  
*Saperda tridentata*, 427, 428.  
*Sesia [Hemaris] Buffaloensis*, 451.  
*diffinis*, 450.  
*Smerinthus geminatus*, 451.  
*Tenebrio molitor*, 308.  
*obscurus*, 307-308.  
*Thyreus Abbotii*, 451.  
*Zeuzera pyrina*, 426, 427.
- lateralis*, *Phytomyza*, 421.
- latifrons*, *Helophilus*, 440, 462.
- latipennis*, *Spilosoma*, 455.
- latipes*, *Enchophyllum*, 387.
- Lauxania flaviceps*, 462.
- Leaf-miners, 376.
- Leaf-rollers, 374.
- Learned, W. L., insects from, 462.
- Leather beetle, 440.
- Leather eaten by *Attagenus piceus*, 304.
- LeBaron, Dr. Wm. cited, 307, 317, 325, 326, 359, 360.
- Lecanium liriodendri*, 411.  
*salicis*, 411, 413.  
*tiliæ*, 411, 413.
- LeConte, Dr. J. L. cited, 299, 300(3), 305, 364.
- Lecontei, *Callimorpha*, 455.
- lectularia*, *Acanthia*, 458.
- lectularius*, *Climex*, 458.
- Lema trilineata*, 457.
- Lemon, *Papilio Cresphontes* attacking, 337.
- Leontil weevil, 440.
- lentis*, *Bruchus*, 440.
- Leonardus*, *Pamphila*, 449.
- Lepidoptera*, 450, 459, 461, 465.
- lepidus*, *Anthrenus*, 299, 305.
- Lepyronia parallella*, 393.  
*quadrangularis*, 393.  
*saratogensis*, 393.
- Leucania* sp?, 457.
- leucostigma*, *Orgyia*, 295, 429, 437, 450, 455.
- Lewis, R., insect from, 462.
- libatrix*, *Gonopteryx*, 450.  
*Scoliopteryx*, 456.
- Liburnia arvensis*, 410.
- ligata*, *Systema*, 344.
- lignicolor*, *Hadena*, 456.
- Lilac, *Podesia syringæ* injurious to, 461.
- Lillies, Thousand-legged worm injurious to, 372, 441.
- Lime for insects, 336, 365, 416, 420, 428, 434, 435.
- Lime water for thousand-legged worms, 372, 441.
- liminaris*, *Phlebotribus*, 365-368.
- Linden insect, *Coccus tiliæ*, 409.
- lineata*, *Deilephila*, 451.
- lineola*, *Tabanus*, 462.
- Lintner, J. A., cited, 299, 300, 307, 309, 318, 330.  
on insectivorous birds, 349-351.
- liriodendri*, *Lecanium*, 411.
- List of Butterflies Occurring in the State of New York, cited, 449.
- List of Coleoptera of North America (Henshaw) cited, 300.
- List of North American Lepidoptera in Guenée's *Species Générale*, noticed, 450.
- List of Sphingidæ occurring in the State of New York, referred to, 449.
- Lithacodes [Limacodes] fasciola*, 456.
- Little, M., cited, 339.  
insects from, 338.
- Little, Miss, cited, 339.
- Little, W. C., on *Lachnosterna fusca*, 356-357.
- Livia femoralis*, 404, 411.  
*vernalis*, 404, 411.
- Liviinæ*, 411.
- Lixus concavus*, 463.
- Lockwood, J. L., insects from, 338, 461.
- Locusta (Tragocephala) viridifasciata*, 330.

- Locust: insects attacking,  
*Cossus robinæ*, 426.  
*Thelia bimaculata*, 392.
- Locusts, 297, 330, 333, 439.
- Lodeman, E. G., cited, 318, 433, 435.
- Loew, Dr. H., cited, 309(2), 317, 323(3), 325.
- London purple, 297, 372, 420, 431.  
 peach foliage sensitive to it, 415.  
 lime added lessens injury, 416.  
 solubility of, 415.  
 with Bordeaux mixture, 417.
- Longicorn beetle, 358, 427, 431, 435.
- lucifuga, *Cucullia*, 450.
- Lucilius, *Nisoniades*, 449.
- lumbroides, *Ascaris*, 298.
- Lumsden, G. R., insects from, 462.
- Luna, *Actias*, 455, 456.
- lunata, *Aphis*, 320.
- luteola, *Galerucella*, 297.
- lutescens, *Aulacomerus*, 439.
- Lycomorpha pholus, 450.
- Lygus pratensis, 375.
- Lyons, J. D., cited, 346.  
 insects from, 464.  
 insects on the grounds of, 295.
- M**
- Macquart, cited, 309, 313.
- Macroductylus subspinosus, 418, 462.
- Macropsis, 400.
- maculata, *Vespa*, 461.
- maculicollis, *Clastoptera*, 394.
- maculipennis, *Idiocerus*, 399.
- magnaria, *Ennomos*, 456.
- Mala, *Hemileuca*, 448, 456.
- mali, *Aphis*, 293, 373, 405, 412, 431.  
*Monarthrum*, 440.  
*Myzoxylus*, 407.  
*Psylla*, 323.
- malifoliæ, *Aphis*, 412.
- malifoliella, *Tischeria*, 445, 462.
- Mamestra Arctica, 447.  
 picta, 455.
- Mann, B. P., cited, 309, 311.  
 on *Microdon globosus*, 313.
- Mantissa Insectorum (Fabricius) cited, 299.
- Maple: insects injurious to,  
*Acocephalus vitellinus*, 397.  
*Aphis asceris*, 406.  
*Dryocampa rubicunda*, 295.  
*Elaphidion parallelum*, 357.  
 villosum, 359.  
*Glycobius speciosus*, 442.  
*Gypona flavilineata*, 397.  
*Incurvaria acerifoliella*, 458.  
*Lachnosterna tristis*, 296.  
*Lepyronia quadrangularis*, 393.  
*Ornix acerifoliella*, 458.  
*Penthimia Americana*, 397.  
*Psylla annulata*, 404.  
 vernalis, 404.  
*Zeuzera pyrlna*, 426-427.
- Maple leaf cutter, 458.
- Maple-tree aphid, 406.
- Maple-tree borer, 442.
- Maple-tree pruner, *Elaphidion par allelum*, 357-361.  
 figured, 358.  
 food plants, 359.  
 frequent on oaks, 359.  
 habits, 359, 360.  
 injury to maples, 357, 358.  
 larva, 358, 359, 360.  
 remedy, 361.  
 uncommon on maples, 359.
- marginatum, *Trochilium* (*Bembecia*), 450.
- Marlatt, C. L., cited, 309.  
 fungus on *Pollenia rudis* stated by, 314.
- marginalis, *Dytiscus*, 462.
- Marguerite fly, 421.
- marmorata, *Carynota*, 410.  
*Cyrtosia*, 389.
- Massachusetts Agricultural Repository and Journal cited, 359.
- May-beetle, 353, 356.
- May-bug, 354.
- May-fly, 298.
- McDougal, Mr., insects from, 462.
- McNell, J., cited, 330, 332.
- Meal-worm, 442.
- Mealy bugs, 418.
- megatoma, *Attagenus*, 300, 302, 303.  
*Dermestes* (of *Fabricius*), 300.
- Meigenii, *Eristalis*, 462.
- Meigen [J. W.] cited, 311.
- Melanoplus atlantis, 332.  
 femur-rubrum, 296, 332, 464.  
 spretus, 332.
- Melitæa Nycteis, 448.  
 Phaëton, 448.  
 species, 454.
- Melittia cucurbitæ, 434.
- Meloe angusticollis, 458.
- Melon insect, *Diabrotica vittata*, 364.
- Melsheimer, Dr., cited, 299.
- melsheimerii, *Amblycephalus*, 401.  
*Deltocephalus*, 410.
- Membracidæ, 387.
- Membracis mera, 410
- Memoires Societé d'Agriculture de Caen, cited, 407.
- mera, *Carynota*, 388.  
*Membracis*, 410.
- Meske, Otto, cited, 450.  
 collection of *Lepidoptera*, 459.
- Mesographe stramentalis, 456.
- Microcentrus caryæ, 410.
- Microdon globosus, 313.
- Middletonii, *Aphis*, 371, 441.
- minor, *Athysanus*, 400.  
*Rythoscopus*, 410.
- Mites, 377, 442, 464.
- mitis, *Systema*, 244.
- molitor, *Tenebrio*, 308, 442.
- mollipes, *Aulacizes*, 396.  
*Diedrocephala*, 410.
- Monarthrum mali, 440.
- Monilea fructigena, 369.

- Monohammus confusor, 463.  
 Monostegia ignota, 431.  
 monticola, Telamona, 410.  
 Moore, C. R., insects from, 344, 463.  
 Morris, Miss, on bark-borer associated with  
 peach-yellows, 367.  
 morula, Acronycta, 455.  
 mucronatus, Crangonyx, 347-349.  
 munda, Murgantia, 317.  
 Munson, W. H., on spraying for, and observa-  
 tions on, the apple-worm, 341-342.  
 Murgantia histrionica, 315-317, 441, 463.  
 munda, 317.  
 Muriate of potash for mealy bugs, 418.  
 murinus, Dermestes, 462.  
 Musca domestica, 310, 314.  
 familiaris, 309, 310, 313.  
 harpyia, 310, 314.  
 rudis, 309, 310.  
 muscæ, Empusa, 314.  
 Muscidæ, 309, 310.  
 tomentosæ, 310.  
 musculus, Anthonomus, 431.  
 Museum pests, 381.  
 Mushrooms infested by Gamarus sp.?, 464.  
 Muslin or netting for protecting from insect  
 attack, 362.  
 Mustard, Murgantia histrionica feeds on, 316.  
 Myndus impunctatus, 410.  
 Myriapoda, 372, 441, 466.  
 Myrmeleon? immaculatus, 440.  
 Myron, Darapsa, 450.  
 Mytilaspis pomorum, 373, 411, 413, 464.  
 Myzoxylus mali, 407.  
 Myzus cerasi, 293, 345-346, 369, 411, 412, 440, 463.  
 persicæ, 369.  
 ribis, 370-371.
- N
- Nadata gibbosa, 450, 456.  
 Napthaline and carbonate of lime useless  
 against the rose-bug, 420.  
 Nematocampa filamentaria, 456.  
 nenuphar, Conotrachelus, 297, 422, 440.  
 Neue Beiträge zur Kenntniss der Psylliden  
 (Loew) — Verh. Wien Zool. Bot. Gesell.  
 cited, 317.  
 Neuroptera, 464, 465.  
 New England Homestead cited, 318, 372.  
 New strawberry slug, 431.  
 Newton Horticultural Society and Newton  
 Center Improvement Association, rewards  
 for egg-belts of tent caterpillar, 437.  
 New York Times cited, 348.  
 New York Tribune cited, 300.  
 niger, Chrysops, 462.  
 nigricollis, Clastoptera, 395.  
 nigrinasi, Athysanus, 401.  
 Bythoscopus, 410.  
 Nisoniades Ausonius, 449.  
 Icelus, 449.  
 Lucillus, 449.  
 Persius, 449.  
 species, 449.
- nitida, Alforhina, 353.  
 Nitrate of soda, 372, 418, 441.  
 niveus, Ceanothus, 464(2).  
 Nixon nozzle, 328.  
 Noctuidæ, 450, 453, 455, 456(2).  
 Northern lady-bird, 440.  
 Notman, Mrs. G., Ixodes from 464.  
 Notodonta concinna, 454.  
 species?, 456.  
 noveboracensis, Aulacizes, 396.  
 Dicrocephala, 410.  
 Nozzle for low spraying, 415.  
 Numitor, Ancyloxypha, 461.  
 nupera, Calocampa, 459.  
 Nursery stock injured by white grubs, 353-356.  
 Nycteis, Melitæa, 448.
- O
- Oak insects:  
 Anisota senatoria, 453.  
 Carynota arquata, 388.  
 Cixlus impunctatus, 386.  
 Clastoptera testacea, 393.  
 Cossus robinia, 426.  
 Cyrtosia marmorata, 399.  
 parallelum, 358-360.  
 Elaphidion villosum, 358, 360.  
 Empoa querci, 403.  
 Gypona flavilineata, 397.  
 Lachnus quercifolia, 407.  
 Otiocerus abbotii, 386.  
 coquebertii, 386.  
 kirbyii, 386.  
 Phobetrion pithecium, 461.  
 Smilia auriculata, 389.  
 Inermis, 388.  
 Inornata, 388.  
 querci, 389.  
 vau, 388.  
 vittata, 389.  
 Telemona querci, 391.  
 reclinata, 391.  
 Thelia univittata, 392.  
 Oats, Silvanus Surinamensis in, 462.  
 Oberea bimaculata, 457.  
 tripunctata, 457.  
 obliqua, Acronycta, 456.  
 obliqua, Erythroneura, 403.  
 Typhlocyba, 410.  
 oblongifolia, Amblycorypha, 464.  
 obscurus, Tenebrio, 307-309, 442, 463.  
 Observation of some New York Rhopalocera  
 cited, 456.  
 obsoletum, Dendroleon, 440.  
 obsoletum, Bruchus, 440, 463(2).  
 obtusa, Clastoptera, 393.  
 ocellana, Tmetocera, 293, 296, 373, 440, 462.  
 ocellatus, Smerinthus, 451.  
 ochracea, Systena, 344.  
 Ocnerna dispar, the gypsy moth, 422-426, 432-  
 433, 434, 440.  
 octomaculata, Alypia, 455.

- oculatus, *Alaus*, 448.  
 odora, *Erebus*, 440.  
*Odynerus capra*, 461.  
*Oecanthus niveus*, 464(2).  
 Oestlund, G. W., cited, 371.  
 Offensive odors as preventives of insect attack, 363.  
 Oil-beetle, 458.  
 oleracea, *Pieris*, 444, 449.  
*Oliarus quinquelineatus*, 410.  
*olitoria*, *Coelidia*, 398.  
*olitorius*, *Jassus*, 410.  
 Olivier: *Encyclopédie Methodique. Histoire Naturelle des animaux* cited, 300.  
 Onion-fly, 375.  
*Ontariella*, *Depressaria*, 454.  
*opaculus*, *Hylesinus*, 367.  
*ophthalmicus*, *Smerinthus*, 451.  
*Optilete*, 410.  
 Orange County Farmer cited, 318.  
 Orange insects:  
     *Elaphidion parallelum*, 359.  
     *Papilio Cresphontes*, 337.  
*orbitalis*, *Evacanthus*, 397.  
 Orchards: insects injurious to,  
     *Anisopteryx vernata*, 296.  
     *Carpocapsa pomonella*, 296.  
     *Clisiocampa Americana*, 293.  
     *Pssylla pyricola*, 323, 324, 325, 326.  
     *Tmetocera ocellana*, 293, 296, 373.  
 Orchard spraying in a wet season, *Bulletin* cited, 436.  
 Orchard tent-caterpillar, 293.  
*Orgyia leucostigma*, 295, 429, 437, 450, 452. J  
*Ormenis pruinosa*, 410.  
*Ornix acerifolliella*, 458.  
*Orthoptera*, 330, 333, 464, 466.  
*Orthoptera* of New England (Fernald) cited, 330.  
*oryzæ*, *Calandra*, 308.  
 Osborn, H., cited, 333.  
*Oscinidæ*, 313.  
 Osten Sacken, Baron, cited, 309, 310.  
     on species of *Chlorops*, 313.  
     on the Marguerite fly, 421.  
*Otiocerus abbotii*, 386.  
     *coquebertii*, 386.  
     *degeerii*, 386.  
     *kirbyii*, 386.  
     *wolfii*, 386.  
*Otiorhynchus ovatus* infesting a dwelling-house, 297, 422, 463.  
*ovatus*, *Otiorhynchus*, 297, 422, 463.  
 Owl beetle, 447, 458.  
 Oyster-shell scale, 373.
- P
- Packard, A. S., cited, 317, 345(2), 349, 359, 360, 423, 452.  
*Pæonies*, *Ellychnia corrusca* occurring on, 463.  
 Pale-colored flea-beetle, 375.  
*palliatus*, *Desmocerus*, 462.  
*pallidus*, *Idiocerus*, 399.  
*pallipennis*, *Carpophilus*, 462.  
*Pamphila Leonardus*, 449.  
*panicea*, *Sitodrepa*, 440.  
*Papilio* cited, 426.  
*Papilio Cresphontes*, 336-337, 461.  
     abounds on a Mexican plant at Glen Cove, 336.  
     distribution from South America to Montreal, 337.  
     figure of larva, 337.  
     fondness for *Fraxinella*, 337.  
     food-plants, 337.  
     gradual northern extension, 337.  
     occasional abundance in New York, 337.  
*parallela*, *Aphrophora*, 410.  
     *Parorgyia*, 455.  
     *parallela*, *Lepyronia*, 393.  
*parallelum*, *Elaphidion*, 357-361.  
*Paramesus vitellinus*, 410.  
*Parasa chloris*, 443.  
 Parasite of  
     Cabbage butterfly, 447, 454.  
     *Clisiocampa Americana*, 461.  
     *Euchætes egle*, 452.  
     *Hemileuca Maia*, 448.  
     *Lagoa crispata*, 452.  
     *Myzus ribis*, 370.  
     *Sphinx Celeus*, 461.  
*Paria aterrima*, 463.  
*Paris green*, 297, 336, 340, 343, 345, 372, 374, 415, 416, 417, 423, 428, 432, 433, 434, 435, 443.  
*Parorgyia parallela*, 455.  
*Parsley*, *Plusia brassicæ* on, 296.  
*parta*, *Catocala*, 456.  
*Parthenos*, *Platarctia*, 452.  
*Peach-bark Scolytus*, *S. rugulosus*, 365-366.  
     abundance, 365.  
     attack fatal to trees unless arrested, 366.  
     elm-bark beetle an erroneous name, 367.  
     kerosene recommended for it, 366.  
     life-history not fully known, 366.  
     remedies, 365, 366.  
     *Scolytidæ* can not cause yellows, 367.  
     sometimes associated with yellows, 367.  
     usually attacks diseased trees, 366, 367.  
*Peach*: insects injurious to,  
     *Carpocapsa pomonella*, 340.  
     *Elaphidion villosum*, 353-359.  
     *Myzus persicæ*, 369.  
     *Phloeotribus liminaris*, 365.  
     *Sannina exitiosa*, 367.  
     white grubs, 354.  
*Peach-tree aphid*, 369.  
     blight, 408.  
     borer, 367.  
*Pea insect*, *Bruchus pisi*, 439.  
*Pear-blight beetle*, 419.  
*Pear*: insects injurious to,  
     *Diplosis pyrivora*, 318.  
     *Dynastes Tityus*, 342, 444, 463.  
     *Eriocampa cerasi*, 335, 440.  
     *Euphoria Inda*, 443, 463.  
     *Macroductylus subspinosus*, 420.

- Pear:** insects injurious to — (*Continued*) :
- Phytoptus pyri, 442.
  - Psylla pyri, 321, 322, 323.
    - pyricola, 293, 317-329, 429, 430, 445.
    - pyrisuga, 322.
  - Selandria cerasi, 335.
  - Xyleborus dispar, 365, 419.
  - Zeuzera pyrina, 426.
- Pear-leaf blister,** 377, 442.
- Pear midge,** 318, 324.
- Pear-tree Psylla, Psylla pyricola,** 293, 317-329, 429, 434, 441, 445.
  - abundance at Catskill, N. Y., 324.
  - bibliography, 317-318.
  - described by Dr. Harris, 321.
  - distribution in the United States, 325.
  - Dr. Harris' early observations on, 320-322.
  - Dr. Riley's studies of, 322.
  - earliest notice of in the United States, 319-321.
  - eggs described and figured, 328.
  - eggs unaffected by kerosene, 329.
  - family of Psyllidæ characterized, 319.
  - figures of different stages, 318, 319, 327, 328.
  - Genet's observations, 320.
  - hibernating brood, 327.
  - honey-dew secretion, 323, 328.
  - Injuries from, 320-321, 323-326.
  - introduced from Europe, 318.
  - its brief life-cycle, 327.
  - kerosene emulsion for killing it, 329.
  - life-history, 326-328.
  - Mr. Slingerland's observations and studies, 326-328.
  - multiplication in the Hudson river valley, 322-325.
  - New England localities, 325.
  - occurrence in western States, 325.
  - pear trees killed by it, 326.
  - ravages at Ghent, N. Y., 324.
  - remedies, 329.
  - winter form simulans, 328.
- Pear-tree or cherry-tree slug,** 335-336.
- Pear-tree Scolytus,** 366.
- Pear-tree slug,** 440.
- Pearson, Colonel,** cited, 420.
- Pease, Ira,** insect from, 461.
- Pea weevil,** 439.
- Peck, Prof. C. H.:**
  - honey-dew fungus identified by, 347.
  - on diseased Austrian pines, 377-378.
  - insects from, 461.
  - on the pear-tree Psylla, 324, 328.
- Peck [Prof. W. D.] cited,** 335, 359.
- Pediopsis trimaculatus,** 400.
  - viridis, 399.
- Pelargium, Plusia brassicæ** on, 296.
- Pemphiginae,** 413.
- Pemphigus pyri,** 411, 413.
  - tessellata, 346-347, 411, 413, 463.
  - associated with fungus, 347.
- Penhallow, D. P. cited,** 367.
- Pennsylvanica, Epicauta,** 443, 463.
- Pennsylvanicus, Bombus,** 461.
  - Chauliognathus, 344.
- Pentatomidæ,** 315.
- Penthimia Americana,** 397.
  - hemorrhoea, 397.
  - sanguinicollis, 397.
- Periodical cicada,** 440.
- Perkins, G. H., cited,** 356.
- Peroxide of silicates as an insecticide,** 363.
- Persian insect powder,** 352.
- persicæ, Myzus,** 369.
- Persius, Nisoniades,** 449.
- Petite Faune Entomologique du Canada —**
  - Coleoptères, cited, 300, 307.
- Phaëton, Melitæa,** 448.
- Phalænidæ,** 453, 456.
- Philampelus Achemon,** 451.
- Phlepsius fulvidorsum,** 410.
  - irroratus, 410.
  - strobi, 410.
- Phlæotribus limnaris,** 365-368.
- Phobeton pithecium,** 443, 455-456, 461.
- pholus, Lycomorpha,** 450.
- Phorodon humuli,** 294, 369.
- Phosphates,** 418.
- Phyllotreta vittata,** 375.
- Phylloxera vitifoliae,** 347, 464.
- Phymata Wolfii,** 463.
- Phytomyza chrysanthemi,** 421.
  - lateralis, 421.
- Phytonomus punctatus,** 440.
- Phytoptidæ,** 377, 442.
- Phytoptus pyri,** 442.
- piceus, Attagenus,** 299-306.
  - Dermestes, 300.
- picta, Ceramica,** 455.
  - Mamestra, 455.
- Pierce, W. C. on the white-pine weevil,** 344.
- Pieris oleracea,** 444, 449.
  - rapæ, 442, 444, 446, 447, 449, 454(2).
- Pike [Nicolas] cited,** 426, 427.
- pinastri, Ellema,** 449.
- Pine-bark Chermes,** 454.
- Pine: insects attacking,**
  - Aphis pinicolens, 406.
  - Bythoscopus strobi, 398.
  - Chermes pinicorticis, 454.
  - Chionaspis pinifoliae, 377.
  - Cixius pini, 385.
  - Clastoptera pini, 333-394.
    - testacea, 393.
  - Eacles imperialis, 453.
  - Ellema pineum, 449.
  - Empoa coccinea, 403.
  - Eriosoma strobi, 409.
  - Lepyronia parallella, 393.
    - saratogensis, 393.
  - Livia femoralis, 404.
  - Pissodes strobi, 345.
- Pine-tree blight,** 409.

- pineum, Ellema, 449.  
 plni, Cixius, 385.  
     Clastoptera, 393-394, 410.  
 pinicolens, Aphis, 406, 412.  
 pinicorticis, Chermes, 454.  
     Coccus, 454.  
 pinifoliae, Chionaspis, 377.  
 Pinus strobus, Eacles imperialis on, 453.  
 pisi, Bruchus, 439.  
 Pissodes strobis, 344-345.  
 pithecium, Phobetron, 443, 455-456, 461.  
 Plant-lice, 319, 347, 369, 370, 371, 372, 373, 418, 432.  
 Platarctia Parthenos, 452.  
 Plathemis trimaculata, 464.  
 Platycerura furcilla, 450, 455.  
 Platymetopius acutus, 410.  
 Platysamia Cecropia, 455.  
 Plumb, Dr. O. on pear Psylla, 319-320, 321, 322.  
 Plum curculio, 297, 417, 422, 433-434, 440.  
 Plum: insects injurious to,  
     Aphis mall, 431-432.  
     pruni, 367.  
     Carpocapsa pomonella, 340.  
     Conotrachelus nenuphar, 297, 440.  
     Elaphidion parallelum, 359.  
     Eriocampa cerasi, 335.  
     Myzus cerasi, 346, 440.  
     Selandria cerasi, 335.  
     white grubs, 354.  
 Plum-tree aphid, 368-369.  
 Plusia æroides, 456.  
     balluca, 456.  
     brassicæ, 296, 422, 462.  
 Podisus spinosus, 457.  
 Podosesia syringæ, 338, 461.  
 Pœciloptera pruinosa, 387.  
     vulgaris, 387.  
 Pollenia, 310.  
     atramentaria, 313.  
     rudis, 309-314, 439.  
     vespillo, 310, 313.  
 Polyphemus, Telea, 456.  
 Polystictus versicolor, a fungus, 462.  
 pomifoliella, Bucculatrix, 445.  
 pomonella, Carpocapsa, 296, 338-342, 422.  
 pomorum, Mytilaspis, 373, 411, 413, 464.  
 Pomroy, Norman, insects from, 464.  
 Poplar insects:  
     Aphis populifoliae [Chaitophorus populi-  
     foliae], 406, 412.  
     Aulacomeris lutescens [Cladius vimi-  
     nalis] 439.  
     Chaitophorus populi, 411, 412.  
     populifoliae, 411, 412.  
     Idiocerus lachrymalis, 398.  
     pallidus, 399.  
     Lachnus populi [Chaitophorus populi], 407  
     412.  
 Poplar saw-fly, 439.  
 Potash salts, 418.  
 Potato insects, etc.:  
     Acariden, 464.  
     Cosmopepla carnifex, 458.  
     Doryphora decemlineata, 297.  
     Julus cœruleocinctus, 464.  
     Lachnosterna fusca, 296.  
     white grubs, 356.  
 Powell, G. T. cited, 318, 326.  
     pear-tree Psylla in orchards of, 324, 326.  
 Practical Entomologist cited, 300, 307.  
 Prairie Farmer cited, 300.  
 pratensis, Bryobia, 440.  
     Lygus, 375.  
 Prickly-ash, Papilio Cresphontes on, 337.  
 Proceedings of the Academy of Natural  
 Sciences of Philadelphia cited 269(3), 300(3).  
 Proceedings of the Albany Institute cited, 299,  
 446, 454(2).  
 Proceedings of the American Association for  
 the Advancement of Science cited, 317(2).  
 Proceedings of the American Philosophical  
 Society cited, 300(2).  
 Proceedings of the Biological Society of Wash-  
 ington cited, 317, 322.  
 Proceedings of the Boston Society of Natural  
 History cited, 300(2), 304.  
 Proceedings of the United States National  
 Museum cited, 309(2), 311.  
 Proconia quadrivittata, 395-396.  
 prolifica, Chloropisca, 440.  
     Chlorops, 313, 440.  
 Promethea, Callosamia, 455.  
 Protection from the cabbage maggot, 431.  
 Protection from the striped cucumber beetle,  
 419.  
 Proteus, Clastoptera, 394.  
 Provancher, l'Abbé, cited, 300, 307.  
 pruinosa, Cicada, 385.  
     Ormenis, 410.  
     Pœciloptera, 387.  
 pruni, Aphis, 369.  
 Psyche cited, 309, 311, 330, 410,  
 Pycnocomorpha epimenis, 455.  
 Psylla annulata, 404, 411.  
     carpini, 404, 411.  
     mali, 323.  
     pyri, 321, 322, 323, 441.  
     pyricola, 293, 317-329, 445,  
     pyrisuga, 317, 322, 323.  
     quadrilineata, 404, 411.  
     tripunctata, 404, 411.  
 Psyllidæ, 317, 319, 381, 404, 411.  
 Psyllinæ, 411.  
 Ptelea, Papilio Cresphontes on, 337.  
 Pteromalus puparum, parasitic on Pieris rapæ,  
 447, 454.  
 pulcherraria, Cleora, 450.  
 Pulvinaria salicis, 411.  
 punctatus, Phytomomus, 440.  
 Pupa of Doremma undulosa, 452.  
     Elaphidion parallelum, 358.

## Pupa of— (Continued) :

- Hemileuca Maia, 448.
- Lagoa crispata, 452.
- Murgantia histrionica, 315.
- Pissodes strobi, 344.
- Psylla pyricola, 327.
- Thyreus Abbotii, 451.
- puparum, Pteromalus, 447, 454.
- putator, Stenocorus, 358-359.
- Pyrameis Atalanta, 454.
- Pyrethrum, 312, 314, 363, 371, 420, 441, 442.
- pyricola, Psylla, 317-329, 445.
- pyri, Eriosoma, 408, 413.
  - Pemphigus, 411, 413.
  - Phytoptus, 442.
  - Psylla, 321, 322, 323, 441.
  - Xyleborus, 419.
- pyrina, Zeugera, 426-427, 462.
- pyrisuga, Psylla, 317, 322, 323.
- pyrivora, Diplosis, 318, 441.
- Pyrrharetia isabella, 439.
- Pyrrhia umbra, 456.

## Q

- quadrangularis, Lepyrionia, 393.
- quadrigibbus, Anthonomus, 419.
- quadrilineata, Psylla, 404, 411.
- quadrinotata, Aphrophora, 392.
- quadrivittata, Proconia, 395-396.
- Quassia useless against the rose-bug, 420.
- querci, Atyma, 410.
  - Empoa, 403.
  - Smilia, 389.
  - Telamona, 391.
  - Typhlocyba, 410.
- quercifolia, Lachnus, 407, 412.
- Quercus prinoides, Anisota senatoria on, 453.
- Quince, Eriocampa cerasi on, 335.
- quingulineatus, Cixius, 386.
  - Oliarus, 410.

## R

## Radish insects:

- Murgantia histrionica, 316, 317.
  - munda, 317.
- Phyllotreta vittata, 375.
- rapæ, Pieris, 442, 444, 446, 447.
- Raspberry borer, 457.
- Raspberry insects:

## Rasperry insects:

- Cœlidia olitoria, 398.
- Erythroneura vulnerata, 402-403.
- Macroductylus subspinosus, 420.
- Oberea bimaculata, 457.
  - tripunctata, 457.
- Raupenleim, or insect lime, 425.
- reclivata, Telamona, 391.
- Red ants, 371, 441.
  - spider, 432.
- Red-legged locust, 332.
- Red-winged Grapta, 446.
- Reed, C. M., insects from, 463.
- Reilly, R. M., insects from, 463.

Remarks at a Field Meeting of the Albany Institute, notice of, 454(2).

Remarks on Myrmeleon, Termes, etc., notice of, 454.

## Remedies for insect attacks:

- acetate of copper, 420.
- acid and lime wash, 365, 366.
- Babbitt's Continental Washing-powder, 434.
- bagging, 364.
  - banding with burlaps, 425.
    - tar paper, 424.
  - benzine, 304, 305.
  - bisulphide of carbon, 308, 363, 427, 439, 442, 443.
  - bone dust, 363.
  - Bordeaux mixture, 420.
  - burdock infusion, 362.
  - burning, 316, 361, 423, 424, 441, 442, 444, 445.
  - camphor, 305.
  - carbolic lime, 420.
  - carbolic acid, 363, 418, 428, 441.
    - with oils, 442.
  - carbonate of copper solution, 417.
    - lime, 420.
  - castile soap, 444.
  - caustic potash, 444.
  - Cocculus indicus berries, 352.
  - coal soot, 363.
  - collecting the egg-belts, 437, 441, 444.
  - copper compounds, 436.
    - solution, 369.
  - corn meal, 444.
  - creosote oil, 434.
  - crushing the eggs, 316, 441.
  - cyanide potassium, 252.
  - decoction of quassia, 420.
  - destroying hibernating insects, 441.
  - fencing out insects, 363.
  - gasoline, 352.
  - gauze-covered frames, 363.
  - Gold Dust Soap-powder, 432.
  - gypsum, 363.
  - hand-picking, 316.
  - hellebore, 316, 336, 372, 431, 440.
  - hot water, 316, 371-372, 441.
  - hydrocyanic acid gas, 352.
  - infested shoots burned, 345.
  - insectivorous birds, 349-351, 356, 357.
  - jarring, 365.
  - kerosene, 304, 316-317, 329, 372, 366, 424, 425, 430, 432, 434, 442, 444.
  - kerosene emulsion, 316, 329, 345, 353-354, 362, 369(3), 373, 374, 375-376, 420, 430, 431, 436, 440-441, 442, 443, 444.
  - lime, 336, 416, 418, 420, 434, 435, 441.
  - London purple, 297, 372, 414-415, 416, 417, 420, 435.
  - manures, 363.
  - mechanical coating, 363.
  - muriate of potash, 418.
  - muslin or netting coverings, 362.
  - naphthaline, powdered, 420.

Remedies for — (*Continued*) :

- nitrate of soda, 372, 418, 441.
- offensive odors, 363.
- Paris green, 297, 336, 341, 343, 345, 372, 374, 415-416, 417(3), 423, 428, 432-433, 434, 443.
- peroxide of silicates, 363.
- Persian insect powder, 352.
- phosphates, 418.
- planting beans with cucumbers, 363.
- poisonous coating, 363.
- potash salts, 418.
- pyrethrum, 312, 314, 363, 371, 418, 420, 441.
  - with flour, 442.
- raupenleim, insect lime, 425.
- removal of the outer bark of the tree, 428-429.
- road dust, 336.
- saltpetre, 363.
- sludge-oil soap, 418, 420.
- slug shot, 363.
- soap suds, 345, 369, 370, 441(2).
- sulphate of copper, 434.
- sulphur, 352, 442.
- tar, 442, 441.
- tarred paper, 431.
- tobacco. 345, 369, 370, 371, 372, 418, 419, 420, 441, 442.
- trapping with leaves, 316, 441.
- turpentine, 352.
  - and land plaster, 363.
- whale-oil soap, 370, 440.
- white arsenic and lime, 434-435.
- whiting, 418.
- wood ashes, 372.
- X. O. dust, 418, 420.

## Remedy for the —

- American meal-worm, 308, 309, 442.
- apple-leaf miner, 445.
- apple tree aphid, 372, 373, 431-432.
  - bark-louse, 373.
  - Bucculatrix, 445.
  - tent-caterpillar, 436, 441.
- army-worm, 443.
- bean weevil, 439.
- bed-bug, 458.
- beet-leaf miners, 375.
- black blister beetle, 443.
- black-rot, 436.
- blight in asters, 372.
- brown-rot, 369, 417.
- cabbage aphid, 432.
  - butterfly, 442.
  - fly, 431.
  - maggot, 418.
  - worm, 444.
- cherry-tree aphid, 345-346, 369, 440.
  - slug, 336.
- cluster-fly, 312, 314, 439.
- codling-moth, 341, 417, 433, 435.
- Colorado potato beetle, 297.
- cow-horn fly, 442.
- curculios, 364, 365, 415, 416.
- currant aphid, 370.

Remedy for the — (*Continued*) :

- elm-tree bark-borer (*Saperda*), 428-429.
- elm-tree borer (*Zeuzera*), 426-427.
- eye-spotted bud-moth, 378.
- flea-beetle, 375.
- fleas, 352-353.
- fungous diseases, 436.
- grain moth (*Sitotroga*), 308, 309.
- grain weevils (*Calandra*, *Silvanus*, etc.), 308, 309.
- grape curculio, 364-365.
- grapevine leaf-hopper, 430.
- Gypsy moth, 423, 424, 425, 432-433, 434.
- harlequin cabbage-bug, 316-317, 441.
- Indian cetonian, 443.
- leaf blights, 436.
  - miners, 376.
  - rollers, 374.
- maple-tree borer, 442.
  - pruner, 361.
- meal-worm, 442.
- oak-pruner, 361.
- peach-bark *Scolytus*, 365.
- pear-leaf blister, 442.
- pear-tree aphid, 369.
  - borer, 366.
  - mite, 442.
  - psylla, 329, 430, 441.
  - slug, 336, 440.
- pea-weevil, 439.
- plant-lice, 418.
- plum aphid, 369.
  - curculio, 417, 433, 434.
- plum-leaf fungus, 417.
- potato-scab, 436.
- powdery mildew, 436.
- raspberry borer, 457.
- red spider, 432.
- root grubs, 444.
- root-inhabiting aphid, 371.
- rose-bug, 418, 420.
- rose-leaf roller, 418.
- scale insects (*Coccidæ*), 447, 454.
- scurfy bark louse, 441.
- strawberry root grub, 443.
  - slug, 431.
  - weevil, 431.
- striped cucumber beetle, 362, 363, 364, 419.
  - flea beetle, 375.
- tarnished plant-bug, 375.
- tent caterpillars, 433, 444.
- thousand-legged worms, 372.
- thrips on cabbage, 444.
- turnip-flea beetle, 375.
- weevil in a granary, 444.
- white grub, 353-354.
- white-pine weevil, 345.
- remotepunctata*, *Calandra*, 308.
- Report of the Commissioner of Agriculture cited, 317, 349, 341.
- Report of the Commissioner of Patents cited, 317, 356.

- Report of the Committee on Entomology, 414-421, 422-437.
- Report of the Department of Agriculture cited, 333, 334.
- Report of the Entomological Society of Ontario cited, 300(2).
- Report of the Maine State Agricultural Experiment Station cited, 341.
- Report of the New York State Cabinet of Natural History cited, 381, 448(2), 449(6), 450(4).
- Report of the New York State Museum cited, 299, 439, 451(4), 452(5), 453(5), 455(5), 456(4), 457.
- Report of the Office of Experiment Stations cited, 414.
- Report of the Ontario Fruit Growers' Association cited, 414.
- Report of the Peabody Academy of Science cited, 448.
- Report of the State Entomologist for 1890 cited, 439.
- Report of the Statistician of the United States Department of Agriculture cited, 368.
- Report of the United States Entomological Commission cited, 330, 345.
- Report of the Wisconsin Agricultural Experiment Station cited, 431.
- Report on the Insects of Illinois cited, 307, 330(2), 331, 354, 360, 365, 371.
- Report on the Insects of Missouri cited, 331, 355, 365, 457.
- Report on the Insects of New York cited, 295, 296, 297(3), 299(5), 300, 303, 313(2), 315, 316, 317, 318, 324, 330(2), 331(2), 342(2), 344, 345-346, 353, 359(2), 362, 373, 375, 439(3), 447, 457(4), 458(5).
- Resistance of fleas to insecticides, 352.
- Revision of Some of the American Butterflies, notice of, 448.
- Rhinoceros beetle, 342, 440.
- Rhopalocera, 456.
- Rhopalosiphum, 412.  
berberidis, 411.
- Rhyssa atrata, 454.
- ribearia, Abraxas [Eufitchia], 456.
- ribis, Myzus, 370-371.
- Rice, A. C., insects from, 463.
- Riley, C. V. cited, 300, 301, 307, 309, 311(2), 317, 318, 330, 341, 354, 419, 457.  
corrections and notes to Fitch Homoptera, 381, 411.  
on feather felting by Attagenus, 364.  
on *Psylla pyricola*, 322.  
on the Strawsonizer machine, 417.  
quoted, 315, 331, 355.
- rimosa, Cicada, 335.  
Tibicen, 410.
- Ring-rot, 378.
- Road dust for insects, 336.
- Roberts, M. cited, 428(2).
- robiniae, Xyleutes [Cossus], 450.
- Rocky mountain locust, 332.
- Root-feeding aphid, 371.
- Root-grubs, 444.
- rosaceana, Caccœcia, 418.
- Rose, A. P. cited, 343.
- Rose-bug: attempts to control it in Vineland, N. J., futile, 420.  
Dr. Smith's experience with it, 430.  
insecticides, etc., tested on it, 420.  
sludge-oil soap the most effectual, 418.  
valuable paper on, 419.  
voracity of the insect, 420.
- Rose insects:  
Caccœcia rosaceana, 418.  
Chauliognathus Pennsylvanicus, 344, 463.  
Cochliopodæ species, 443.  
Macrodactylus subspinosus, 419-420.  
Parasa chloris, 443.  
Tetranychus telarius, 432.  
white grubs, 354.
- Rose, J. F., insects from, 461.
- Rose-leaf caterpillar, 443.  
roller, 418.
- Round-headed apple-tree borer, 440.
- rubicunda, Dryocampa, 295, 422, 455.
- rudbeckiæ, Aphis, 406, 412.  
Siphonophora, 411, 412.
- rudis, Musca, 309, 310.  
Pollenia, 309-314, 439.
- rufimanus, Bruchus, 440.
- rufipennis, Attagenus, 300.
- rufocoxalis, Apanteles, 461.
- rugosa, Lachnosterna, 355.
- rumicis, Aphis, 440.
- Rural New Yorker cited, 300, 324, 363, 420, 439.
- Rutaceæ, Papilio Cresphontes attacking, 337.

## S

- salicellis, Lachnus, 407, 412.
- salicis, Chionaspis, 411.  
Coccus, 409, 411, 413.  
Lecanium, 411, 413.  
Pulvinaria, 411.
- Saltpetre tested for the cucumber beetle, 363.
- sambucifoliæ, Aphis, 406, 412.
- sanguinicollis, Penthimia, 397.
- Sannina exitiosa, 367.
- Saperda candida, 440.  
tridentata, 427-429.
- saratogensis, Aphrophora, 410.  
Lepyronia, 393.
- Saunders, Wm. cited, 300, 317, 367.
- Saw-flies, 335.
- Sayii, Amblycephalus, 401.
- scabra, Hypena, 454.
- scalaris, Heliria, 410.
- Scale-insect, 377, 440.
- scarlatina, Gypona, 397.
- Scarlet Empoa, 403.
- Scepsis fulvicollis, 456.
- Schenectady Union cited, 299.
- Schizoneura imbricator, 411, 412.  
lanigera, 411, 412.  
ulmi, 411, 412.

- Schizoneurinae, 412.  
 Schlægeri, Cryptolechia, 456.  
 Schwarz, E. A. cited, 307.  
 Science cited, 300, 318, 441.  
 Scoliopteryx libatrix, 456.  
 Scolytidae, 365, 367.  
 Scolytus beetle, 428.  
 Scorias spongiosum, a honey-dew fungus, 347, 463.  
 scrophulariæ, Anthrenus, 299-306.  
 Scudder's Butterflies of the Eastern United States cited, 345.  
 Scudder, S. H. cited, 330(2), 448.  
 Scurfy bark-louse, 440.  
 Selandria cerasi, 335.  
 seminudus, Eutettix, 410.  
 senatoria, Anisota, 450, 453.  
 septendecim, Cicada, 365, 440.  
 serrata, Hæmatobia, 296, 442, 444, 462.  
 serraticornis, Cucullia, 456.  
 Sesiadæ, 338.  
 Sesia diffinis, 450.  
   Buffaloënsis, 451.  
 Seventeen-year locust, 333.  
 sex-guttata, Cicindela, 462.  
 Shear, C. L., insects from, 462.  
 signatus, Anthonomus, 431.  
 Silk-weed insect, Aphis asclepiadis, 405.  
 Silk-worms, 423.  
 Silliman's Journal of Science cited, 309.  
 Silpha Americana, 462.  
 Silvanus advena, 308.  
   cassiae, 308, 462.  
   Surinamensis, 308, 462.  
 Simmons, Mrs. H., insects from, 461.  
 simulans, Psylla, 328.  
 sinuata, Entilia, 387.  
 Siphonophora asclepiadis, 411.  
   avenæ, 294.  
   rudbeckiæ, 411, 412.  
 Sitodrepa panicea, 440.  
 Sitotroga cerealella, 308.  
 Slingerland, M. Y. on the pear-tree Psylla, 318, 319, 325, 329, 429.  
 Slocombe, Edwin, insects from, 464.  
 Sludge-oil soap, 365, 366, 418, 420.  
 Sludge-oil soap, carbolic acid and lime wash, 365, 366.  
 Slugs, 335, 336, 440.  
 Slug-shot tested as a remedy, 363.  
 Smart, J. S., insects from, 296, 463.  
 Smerinthus Cerisyi, 451.  
   geminatus, 451.  
   Jamaicensis, 451.  
   ocellatus, 451.  
   ophthalmicus, 451.  
 Smilia auriculata, 389.  
   castaneæ, 389.  
   guttata, 389.  
   inermis, 388.  
   inornata, 388.  
   querci, 389.  
 Smilia species — (Continued):  
   vau, 388.  
   vittata, 389.  
 Smith, Dr. J. B. cited, 315, 318, 325(2), 430.  
   experience with the rose-bug, 420.  
   on potash-salts as insecticides, 418.  
   on sludge-oil soap, 418.  
   on the rose-bug, 419-420.  
 Smith, J. W., insects from, 368.  
 Smith, Mrs. E. B., insects from, 461(2), 462, 463, 464.  
 Snowball: Hemaris Buffaloënsis on, 451.  
 Snow, G. C., insects from, 365, 366.  
 Soap-powders, 434.  
 Soap suds, 345, 369, 371, 432, 441(2).  
   for cabbage aphid, 432.  
 Soldier-bug, 457.  
 Solidago gigantea and S. serotina, Aphis rudbeckiæ on, 406.  
 Solubility of London purple, 415.  
 Sour-gum trees attractive to the rose-bug, 420.  
 Southwick, E. B. cited, 426.  
   insects from, 462.  
 Species Général des Lépidoptères (Guenée), cited, 450.  
 Species Insectorum (Fabricius) cited, 299.  
 speciosus, Glycobius, 442.  
 Spectre-insect, 446.  
 Spectrum femoratum, 446.  
 Speyer, Dr. A. cited, 450, 454.  
 Speyeri, Cucullia, 456.  
 Sphingidæ, 449, 450, 451, 452, 459.  
 Sphinx Celeus, 461.  
 Sphinx, New, Ellema pineum, 449.  
 Spilosoma latipennis, 455.  
   Virginica, 440, 455.  
 Spindle-worms, 447.  
 spinosa, Arma, 457.  
 spinosus, Podisus, 457.  
 Spotted horn-bug, 342, 444.  
 Spraying, 297, 336, 340, 342, 343, 345-346, 365, 369, 370, 372, 373, 374, 417(2), 423, 424, 430, 431, 432(2), 433, 434, 435, 440, 441, 442.  
 Spraying for codling-moth, 417, 433.  
   Fungous Diseases, Bulletin on, cited, 435.  
   Insects and Fungous Pests, Bulletin on, cited, 436.  
   plum curculio, 417, 333.  
 Spraying fruits, 436.  
   machinery, 436.  
   orchards in a wet season, Bulletin on, cited, 436.  
   with insecticides, article on, 414-418.  
 spretus, Caloptenus, Melanoplus, 332.  
 Spruce insects;  
   Athysanus abietis, 400.  
   Cixius pini, 385.  
   Lachnus abietis, 407.  
   Pissodes strobis, 344.  
   spureus, Attagenus, 300.

- Squash-bug, 434.  
 Squash, *Diabrotica vittata* injurious to, 361.  
 Squash-vine borer, 434.  
 State Board of Agriculture of Massachusetts cited, 423(2), 424.  
*Stenocorus putator* [*Elaphidion villosum*], 358-359.  
*Stenocranus dorsalis*, 410.  
*Stictocephala inermis*, 410.  
*stigmatus*, *Cixius*, 385.  
*stimulea*, *Empretia*, 455.  
*Stomoxys calcitrans*, 444.  
*stramentalis*, *Mesographe*=*straminalis*. *Evergestis*, 456.  
 Strawberry insects:  
   ? *Anisodactylus*, 462.  
   *Anthonomus musculus*, 431.  
     *signatus*, 431.  
   *Harpalus* sp.?, 462.  
   *Lachnosterna fusca*, 296.  
   *Macroductylus subspinosus*, 420.  
   *Monostegia ignota*, 431.  
   *Paria aterrima*, 463.  
 Strawberry root grub, 443.  
   slug, 431.  
   weevil, 430-431.  
 Strawsonizer, an insecticide machine, 417-418.  
 Striped cucumber beetle, *Diabrotica vittata*, 361-364, 419.  
   attack on squash, 361-362.  
   experiments on, 362-363.  
   figures, 362, 363.  
   preventives, 362, 363, 364.  
   protection from, 419.  
 Striped flea-beetle, 375.  
*strobi*, *Eriosoma*, 409, 412.  
   *Lachnus*, 411, 412.  
   *Phepsius*, 410.  
   *Pissodes*, 344-345.  
*stygia*, *Cæcidotea*, 349.  
*stygius*, *Asellus*, 348.  
*subbifasciata*, *Cœlidia*, 398.  
*subspinosus*, *Macroductylus*, 418, 462.  
*sulcifrons*, *Tabanus*, 462.  
 Sulphate of copper as an insecticide, 434.  
 sulphurea, *Arphia*, 330.  
 Sulphur for the pear leaf blister, 442.  
   fumigation, 352.  
 Sulphuric acid with cyanide of potassium as an insecticide, 352.  
 Sunday Morning Press [Albany, N. Y.] cited, 446.  
*Surinamensis*, *Silvanus*, 308, 462.  
*suturalis*, *Idiocerus*, 399.  
 Seventeen-year locust, 385.  
 Swiss Cross cited, 448.  
 Synopsis of the Aphididæ of Minnesota (*Oestlund*) cited, 371.  
*Syringa* borer, 338.  
*syringæ*, *Podosesia*, 338, 461.  
 Syrphid fly, 313.  
*Syrphus* flies, 440.  
*Systema Eleutheratorum* (Fabricius) cited, 299, 300.  
*Systema Entomologiæ* (Fabricius) cited, 290.  
*Systema Naturæ* (Linnæus) cited, 299, 385, 405, 406, 407(2).  
*Systena blanda*, 344, 375.  
   *elongata*, 344.  
   *frontalis*, 297, 313-344, 422, 463.  
   *ligata*, 344.  
   *mitis*, 344.  
   *ochracea*, 344.  
   *tæniata*, 344.  
 T  
*Tabanus lineola*, 462.  
   *sulcifrons*, 462.  
 Tarnished plant-bug, 375.  
 Tar paper, banding with, 424.  
   protection from cabbage maggot,  
*Tarquinius*, *Feniseca*, 346.  
*Telamona ampelopsidis*, 391.  
   *concava*, 390.  
   *coryli*, 391, 410.  
   *fagi* [*Heliria scalaris*], 391.  
   *fasciata*, 390, 410.  
   *monticola*, 410.  
   *querci*, 391.  
   *reclivata*, 391.  
   *tristis*, 391.  
   *unicolor*, 390.  
*Telamones*=*Atlantes*, 390.  
*telarius*, *Tetranychus*, 432.  
*Telea Polyphemus*, 456.  
*tenax*, *Eristalis*, 462(2).  
*Tenebrio molitor*, 308, 442.  
*Tenebrio obscurus*, 307-309, 442, 463.  
   abundance in a granary, 307.  
   American meal-worm, 308.  
   beetle described, 308.  
   bibliography, 307.  
   different stages figured, 308.  
   food-habits, 308.  
   larval features, 307-308.  
   limited literature, 307.  
   pygidial characters of larva, 308.  
   remedy in bisulphide of carbon, 308-309.  
*Tent-caterpillars*, 432, 436, 437, 444.  
*tergatus*, *Chlorotettix*, 410.  
*Termes flavipes*, 454.  
*ternata*, *Choisya*, 461.  
*tessellata*, *Eriosoma*, 408, 413.  
   *Pemphigus*, 346-347, 411, 413, 463.  
*testacea*, *Clastoptera*, 393.  
*Tetranychus telarius*, 432.  
*Tettigonia bifida*, 395.  
   *eight-lineata*, 397.  
   *tripunctata*, 395.  
*Tettigonides*, 396, 402.  
*Tettix* species, 330.  
*Thamnotettix clitelarius*, 410.  
 Thaxter, Dr. R. cited, 314.  
 The Argus [Albany, N. Y.] cited, 299.

- Thecla Irus*, 449.  
*Thelia bimaculata*, 392.  
     *cratægi*, 392.  
 Thistle, *Entilia concava* on, 387.  
 Thomas, A. T. cited, 359.  
     insects from, 358, 360.  
 Thomas, Dr. J. J. cited, 317, 346, 371.  
     on pear tree blight, 320.  
     quoted, 331.  
 thoracica, *Chrysopila*, 462.  
 thoracicus, *Anthrenus*, 299, 301.  
 Thorn-bush insects:  
     *Aphis cratægifoliæ*, 406.  
     *Thelia cratægi*, 392.  
 Thorn-leaf *Aphis*, 406.  
 Thousand-legged worm, 372, 441.  
 Three-banded *Erythroneura*, 403.  
 Three-dotted *Psylla*, 404.  
     *Tettigonia*, 395.  
 Three-lined leaf-beetle, 457.  
 Three-toothed *Saperda*, 429.  
 Thrips, 377, 430, 445.  
 Thyreus *Abbotii*, 451, 461.  
 Thyridopteryx *ephemeræformis*, 440.  
 Thysanoptera, 445.  
 tibicen, *Cicada*, 410.  
 Tibicen *rimosa*, 410.  
     *septendecim*, 410.  
 tilia, *Coccus*, 409, 413.  
     *Lecanium*, 411, 413.  
 Timothy eater, 457.  
 Tineid on trunk of elms, 462.  
 Tipulidæ, 462.  
*Tischeria* apple-leaf miner, 445.  
     *malifoliella*, 445, 462.  
 Tityus, *Dynastes*, 343, 440, 444, 463.  
 Tmetocera *ocellana*, 293, 296, 373, 440, 462.  
 Tobacco, 345, 369, 370, 371, 372, 418, 419, 420, 441, 442.  
 Totype *velleda*, 455.  
 tomentosæ, *Muscidæ*, 310.  
 Townsend, Mr., on grapevine leaf-hopper, 430.  
 Tragocephala, *viridifasciata*, 330.  
*Tragopa dorsalis*, 392.  
 Transactions of the American Entomological Society cited, 300(2), 304, 344, 410, 446, 451.  
 Transactions of the Linnaean Society cited, 386 (4), 387.  
 Transactions of the Maryland Academy of Science cited, 410.  
 Transactions of the New York State Agricultural Society cited, 299, 317, 359.  
 Trapping insects with leaves, 316, 441.  
 Treatise on the Insects of New England (Harris) cited, 317.  
*Tribolium ferrugineum*, 308, 463.  
*tricincta*, *Erythroneura*, 403.  
     *Typhlocyba*, 410.  
*triosa*, *Agrotis*, 456.  
*tridentata*, *Saperda*, 427-429.  
*trilineata*, *Lema*, 457.  
*trimaculata*, *Plathemis*, 464.  
*trimaculatus*, *Pediopsis*, 400.  
*Trioza trispunctata*, 411.  
*Triozinæ*, 411.  
*trispunctata*, *Oberea*, 457.  
     *Psylla*, 404, 411.  
     *Tettigonia*, 395.  
     *Trioza*, 411.  
*tristis*, *Anasa*, 434.  
     *Lachnosterna*, 296, 463.  
     *Telamona*, 391.  
*Trochilium* (*Bembecia*) *marginatum*, 450.  
*Trox unistriatus*, 463.  
*Trypetid*, 462.  
*tuberculatus*, *Hippiscus*, 330.  
 Turnip flea-beetle, 375.  
 Turnip, *Phyllotreta vittata* attacking, 375.  
 Turpentine as an insecticide, 352.  
     with land plaster, 363.  
 twelve-punctata, *Diabrotica*, 440.  
 Two-horned *Ceresa*, 390.  
 Two-spotted *Enchophyllum*, 387.  
     lady-bug, 306, 370.  
     *Thelia*, 392.  
*Typhlocyba affinis*, 410.  
     *coccinea*, 410.  
     *obliqua*, 410.  
     *querci*, 410.  
     *tricincta*, 410.  
     *vitis*, 410.  
     *vulnerata*, 410.

## U

- Uhler, P. R. cited, 317, 410.  
 ulmi, *Lachnus*, 407, 412.  
     *Schizoneura*, 411, 412.  
*Ulmus Americana*, *Saperda tridentata* injurious to, 427.  
*umbra*, *Pyrrhia*, 456.  
*umbrosa*, *Grapta*, 446.  
 Underwood, Prof. L. M. cited, 337.  
*undulosa*, *Daremma*, 452.  
*unicolor*, *Chlorotettix*, 410.  
     *Telamona*, 390.  
*unicornis*, *Cœlodasys* [*Schizura*], 455.  
*unio*, *Eudryas*, 450, 455.  
*unistriatus*, *Trox*, 463.  
*univittata*, *Thelia*, 392.  
*Uroxiphus caryæ*, 392.

## V

- Vaudenberg, Dr. W. H., insects from, 462.  
*Vanduzea arquata*, 410.  
 Van Duzee, E. P. cited, 325, 381.  
     corrections and notes to catalogue, 381, 410.  
 Van Slyke, H., insects from, 462.  
*variabilis*, *Athysanus*, 400.  
*Bythoscopus*, 410.

varia, Hyperchiria, 453.  
 vau, Cyrtolobus, 410.  
     Smilia, 388.  
 velleda, Tolype, 455.  
 Vermorel nozzle, 328, 370, 441.  
 vernalis, Livia, 404, 411.  
 vernata, Anisopteryx, 296, 422.  
 verticis, Jassus, 410.  
 Vespa maculata, 461.  
     species?, 461.  
 vespillo, Pollenia, 310, 313.  
 vetusta, Calocampa, 459.  
 Viburnum opulus, Hemaris Buffaloënsis  
     on, 451.  
 Victorin, Mrs. A., insects from, 461.  
 villosum, Elaphidion, 358, 359.  
 Vineyardist cited, 430.  
 Virginica, Ctenucha, 456.  
     Spilosoma, 440, 455.  
     Xylocopa, 461.  
 viridifasciata, Chimarcephala, 330, 439.  
     Chortophaga, 298, 330-334, 439, 464.  
     Locusta, 330.  
     Tragocephala, 330.  
 viridis, Pediopsis, 399.  
 vitellinus, Acocephalus, 397.  
     Paramesus, 410.  
 vitifolkæ, Phylloxera, 347, 464.  
 vitis, Erythroneura, 403.  
     Typhlocyba, 410.  
 vittata, Diabrotica, 361-364.  
     Smilia, 389.  
     Phyllotreta, 375.  
 vivida, Hystricia, 462.  
 V-marked Smilia, 388.  
 vulgaris, Lamenia, 410.  
     Pœcilopectera, 387.  
 vulnerata, Erythroneura, 402-403.  
     Typhlocyba, 410.

## W

Walking-stick, 446.  
 Walnut: insects attacking,  
     Gypona flavilineata, 397.  
     Idiocerus lachrymalis, 398-399.  
     Otlocerus wolffi, 386.  
     Telamona fasciata, 390.  
     Uroxiphus caryæ, 392.  
     Zeuzera pyrina, 426.  
 Walsh, B. D. cited, 300, 307, 365.  
 Walsh-Riley cited, 317.  
 Water from faucets in Albany, contained  
     Ascaris lumbricoides, 298.  
     blood-leech, sp. undeterm., 298.  
     Gordius species, 298.  
 Webster, F. M. cited, 325, 364, 365.  
 Weed, C. M. cited, 300, 330, 346.  
     experiments on the cucumber beetle, 362-  
     363, 419.  
     on arsenical spraying of plum trees, 417.

Weed, C. M. — (Continued) :  
     on the green-striped grasshopper, 331.  
 Weed, H. E., insects from, 462.  
     remedy for the harlequin cabbage-bug  
     316-317.  
 Weevil in a granary, 443.  
 Westwood, Prof. J. O. cited, 307, 308.  
 Whale-oil soap, 370, 440.  
 Wheat insects :  
     Amblycephalus inlinicus, 401.  
     Delphax arvensis, 386.  
     Leucania species?, 457.  
     Tenebrio molitor, 442.  
     Tenebrio obscurus, 442, 463.  
     Tribolium ferrugineum, 463.  
     white grubs, 356.  
 White arsenic and lime, 434-435.  
 White grubs, 296, 350, 353-357, 422.  
     eaten by the robin, 356-357.  
     injuring nursery stock, 353-356.  
 White-marked tussock-moth, 295, 429, 437.  
     injury by, 295.  
 White-pine weevil, 344-345.  
 Whiting, a component of "X. O. Dust," 418.  
 Willow insects :  
     Anotia bonnetii, 387.  
     Bythoscopus tergatus, 398.  
     Cossus robiniaë, 426.  
     Idiocerus alternatus, 399.  
     pallidus, 399.  
     Lachnus salicellis, 407.  
 Witch-hazel Brysocypta, 409.  
 Wolfii, Otiocerus, 386.  
     Phymata, 463.  
 Woodason bellows-sprayer or atomizer, 415.  
 Woodbine Telamona, 391.  
 Woodworth [C. W.] cited, 410.  
 Woolens : insects injurious to  
     Anthrenus scrophulariæ, 304.  
     Attagenus piceus, 303.  
 Wright, H. S., attack of pear-tree Psylla in  
     orchard of, 326.

## X

xanthomelæna, Galerucella, 297, 422.  
 Xanthoxylum, Papilio Cresphontes on, 337.  
 X. O. Dust, 418, 420.  
 Xyleborus dispar, 419, 466.  
     pyri [dispar], 419.  
     introduced from Europe, 419.  
 Xyleutes [Cossus] robiniaë, 450.  
 Xylocopa Virginica, 461.

## Y

Yellow Acocephalus, 397.  
 Yellow-backed Jassus, 402.  
 Yellow-banded swallow-tail, 336.  
 Yellows not caused by Phlœotribus lliminaris,  
     367.  
 Yellow-striped Gypona, 397.  
 Yellow woolly-bear, 440.

## Z

Zeigler, Rev. D. cited, 384.

Zeitschrift, f. d. Entom. cited, 384.

Zerene catenaria, 450.

Zeuzera æsculi, 426.

Zeuzera pyrina, 426-427, 462:

earliest notice in the United States, 426.

elms and maples mainly attacked, 427.

food-plants in Europe, 426.

Zeuzera pyrina — (Continued):

injuries in and near New York, 426, 427.

introduced from Europe, 426.

its distribution, 426, 427.

ravages in Central Park, New York.

remedies, 426-427.

statement of Mr. Southwick, 426, 427.

taken at electric lights, 426.

Zygænidæ, 456.

# ERRATA.

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- Page 291, line 9, for (Foerster) read Foerster.  
Page 308, line 6 from bottom, for *remotepuncta* read *remotepunctata*.  
Page 317, line 20, for (Foerster). read Foerster.  
Page 320, line 29, for *lunata* read *lanata*.  
Page 333, line 17, for *attennæ* read *antennæ*.  
Page 335, line 18, for *Sclandria* read *Selandria*.  
Page 342, line 19, for Emmond read Emmord.  
Page 344, line 17 from bottom, for Peck. read (Peck).  
Page 363, line 9, after *manure* insert *kerosene*.  
Page 374, line 12, for *Cocæcia* read *Cacæcia*.  
Page 385, line 9, for CREVICED read <sup>2</sup> CREVICED.  
Page 391, line 6, for BEECH read <sup>26</sup> BEECH.  
Page 396, line 11 from bottom, for *attennæ* read *antennæ*.  
Page 410, line 23, for *castanæ* read *castaneæ*.  
Page 410, line 2 from bottom, for *Typhlocyloidæ* read *Typhlocybidæ*.  
Page 411, line 6, read, 84. The root-form of 83.  
Page 411, line 14, for *alicis* read *salicis*.  
Page 412, line 3, after *Rhopalosiphum* insert *berberidis*.  
Page 413, line 2, dele the line, [as *P. pyri* = *Schizoneura lanigera*].  
Page 413, line 6, for (Bouche) read (Bouché).  
Page 415, line 25, for four to read to four.  
Page 442, line 10, for where read wherein.  
Page 445, line 3 from bottom, for *Buculatrix* read *Bucculatrix*.  
Page 450, line 9 from bottom, for Meeke's read Meske's.  
Page 454, line 25, for *Melitæa* read *Melitæa*.  
Page 456, line 11, for *oblinata* read *oblinita*.  
Page 456, last line, for *Schlagæri* read *Schlægeri*.  
Page 457, lines 4-5 from bottom, for girdling read girdling.  
Page 462, last line, for *versicolor* read *versicolor*.  
Page 463, line 4, for C. H. Moore read C. R. Moore.  
Page 464, line 10 from bottom, precede with ARACHNIDA, ETC.  
Page 472, line 14, for plate 6 read plate 1.



# List of Reports of the Entomologist of the State of New York.

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**First Annual Report on the Injurious and Other Insects of the State of New York.** Made to the State Legislature, pursuant to Chapter 377 of the Laws of 1881. Albany: Weed, Parsons and Company, Printers. 1882. Pages xxii, 381, figures 84.

**Second Report on the Injurious and Other Insects of the State of New York.** Made to the Legislature, pursuant to Chapter 377 of the Laws of 1881. Albany: Weed, Parsons and Company, Legislative Printers. 1885. Pages xiv, 265, figures 68.

[Reports of the State Entomologist to the Regents of the University of the State of New York, for the years 1884 and 1885, are published (only) in the 38th and 39th Annual Reports of the New York State Museum of Natural History, for the above-named years, pages 67-76, 77-125.]

[Third Report of the State Entomologist.] **Report of the State Entomologist to the Regents of the University of the State of New York, for the year 1886.** Albany: The Argus Company, Printers. 1887. Published in the 40th Annual Report of the New York State Museum of Natural History, 1887, pages 79-154; also in 200 separates, with cover and title-page.

**Fourth Report on the Injurious and Other Insects of the State of New York.** Made to the Regents of the University, Pursuant to Chapter 355 of the Laws of 1883. Albany: James B. Lyon, Printer. 1888. Pages 237, figures 68. Also as Report of the State Entomologist to the Regents of the University, State of New York, for the year 1887, in the Forty-first Annual Report of the State Museum of Natural History. 1888. Pages 123-358.

**Fifth Report on the Injurious and Other Insects of the State of New York.** Made to the Regents of the University, Pursuant to Chapter 355 of the Laws of 1883. Albany: The Troy Press Company, Printers. 1889. Pages 205; double-paged as 145-347, figures 50. Also as Report of the State Entomologist to the Regents of the University, State of New York, for the year 1888; in the Forty-second Annual Report of the State Museum of Natural History, for the year 1888. 1889. Pages 145-348.

**Sixth Report on the Injurious and Other Insects of the State of New York.** Made to the Regents of the University, Pursuant to Chapter 355 of the Laws of 1883. Albany: James B. Lyon, State Printer. 1890. Pages 107 (97-203), figures 25. Also as Report of the State Entomologist to the Regents of the University, State of New York, for the year 1889; in the New York State Museum Forty-third Annual Report, for the year 1889. 1890. Pages 99-205.

**Seventh Report on the Injurious and Other Insects of the State of New York.** Made to the Regents of the University, Pursuant to Chapter 355 of the Laws of 1883. Albany: James B. Lyon, State Printer. 1891. Pages 211 (195-405), figures 40. Also as Report of the State Entomologist for the year 1890; in the Forty-fourth Annual Report, New York State Museum, for the year 1890. 1892. Pages 197-405.

**Eighth Report on the Injurious and Other Insects of the State of New York, for the Year 1891.** Albany, University of the State of New York. 1893. Pages 218 (103-320), figures 53. Also as Report of the State Entomologist for the year 1891; in the New York State Museum Forty-fifth Annual Report, for the year 1891. Albany: James B. Lyon, Printer. 1892. Pages and figures as above.

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### Some Entomological Publications of J. A. Lintner.

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**Entomological Contributions.** Albany: Weed, Parsons and Company, Printers, 1872. Pages 90, plates (lithographic) 2. Also in the Twenty-third Annual Report on the New York State Cabinet of Natural History [for the year 1869]. 1873. Pages 137-222.

**Entomological Contributions — No. II.** Albany: The Argus Company, Printers, 1872. Pages 76. Also in the Twenty-fourth Annual Report on the New York State Museum of Natural History [for the year 1870]. 1872. Pages 109-170.

**Entomological Contributions — No. III.** Albany: The Argus Company, Printers. May, 1874. Pages 80 (112-192), figures 17. Also in the Twenty-sixth Annual Report of the New York State Museum of Natural History [for the year 1872]. 1874. Pages 117-192.

**Entomological Contributions — No. IV.** Albany: Weed, Parsons & Company, Printers, June, 1878. Pages 144. Also in the Thirtieth Annual Report of the New York State Museum of Natural History [for the year 1876]. 1878. Pages 117-254.

**Report on the Insects and other Animal Forms of Caledonia Creek, New York.** Albany: 1878. Pages 26, plates (lithographic) 3. Also in the Tenth Annual Report of the New York Fishery Commissioners, for the year 1877. Albany: 1878. Pages 12-36, plates 1-3. (For summary of contents, see the Seventh Report on the Insects of New York, 1891, page 373.)

**Lepidoptera of the Adirondack Region.** Albany: 1880. Pages 28. Also in the Seventh Annual Report of the Topographical Survey of the Adirondack Region of New York, by Verplanck Colvin. Albany: 1880. Pages 375-400. (See Sixth Report on the Insects of New York, 1890, page [82] 178.)

**The Insects of the Clover Plant.** Albany: 1881. Pages 17, figures 6. Also in the Transactions of the New York State Agricultural Society for the years 1877-1882, xxxiii, 1884. Pages 187-207. (See Sixth Report on the Insects of New York, 1890, page [88] 184.)

**The White Grub of the May Beetle.** Bulletin of the New York State Museum of Natural History, No. 5. Albany: November, 1888. Pages 31, figures 5. Also in the Transactions of the New York State Agricultural Society, xxxiv, for 1883-1886, pages 5-33.

**Cut-worms.** Bulletin of the New York State Museum of Natural History, No. 6. Albany: November, 1888. Pages 36, figures 28. Also in the Transactions of the New York State Agricultural Society, xxxiv, for 1883-1886, pages 66-100.















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