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Bulletin 327 April, 1931

CONNECTICUT STATE ENTOMOLOGIST

THIRTIETH REPORT

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W. E. BRITTON, Ph.D.
State Entomologist

Connecticut
Agricultural Experiment Station
New Haven

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Tobacco Substation at Windsor.
PAUL J. ANDERSON, PH.D., *Pathologist in Charge.*
T. R. SWANBACK, M.S., *Agronomist.*
O. E. STREET, M.S., *Plant Physiologist.*
MISS DOROTHY LENARD, *Secretary.*

THE TUTTLE, MOREHOUSE & TAYLOR COMPANY, NEW HAVEN, CONN.

CONTENTS

Illustrations

The illustrations in this bulletin are from the following sources: Figures, all from line drawings: 39, adapted from Burgess, Farmers' Bulletin 1623, U. S. Dept. Agr.; 40, 43, 44, 45, maps prepared by B. H. Walden: 41 and 42 prepared by Philip Garman. Plates, all from photographs: 9 from prints furnished by manufacturer: 14 c, after Burgess and Crossman, Dept. Bulletin 1469, U. S. Dept. Agr.; 12 by R. C. Botsford: 1, 2, 3 a, 10 b, 11 and 16 b by W. E. Britton; all others by B. H. Walden.

LETTER OF SUBMITTAL

To the Director and Board of Control of the Connecticut Agricultural Experiment Station:

I have the honor to transmit herewith my thirtieth report as State Entomologist of Connecticut. It contains an account of the official inspection of apiaries and nursery stock as prescribed by statute, and of such control operations as are carried on in coöperation with the Federal Plant Quarantine and Control Administration against the gipsy moth, European corn borer and Japanese beetle. The investigations of Dr. Friend on the life history of the imported birch leaf miner, *Fenusa pumila* Klug, and his paper on the squash vine borer are being prepared for publication as separate bulletins. Other features are brief accounts of the catalpa mealy bug and the saddled prominent, two pests appearing in Connecticut in 1930, mosquito control, and a considerable number of brief papers and notes giving the results of experiments and observations of members of the Department Staff.

Respectfully submitted,

W. E. Britton,
State and Station Entomologist.

FINANCIAL STATEMENT

Report of Receipts and Expenditures of the State Entomologist July 1, 1929, to June 30, 1930

RECEIPTS

Insect pest appropriations, year ending June 30, 1930	$37,500.00	
Additional special appropriations	11,000.00	
Miscellaneous receipts	1,000.00	
		$49,500.00

EXPENDITURES

Salaries	$19,878.00
Labor	16,089.12
Stationery and office supplies	148.12
Scientific supplies, chemicals	7.30
other laboratory supplies	57.68
photographic supplies	38.84
Insecticides, etc.	3,360.57
Lumber and small hardware	4.55
Miscellaneous supplies	914.74
Automobile oil	272.17
Fertilizer	3.55
Telegraph and telephone	269.19
Postage	114.86
Travel expenses, outlying investigations	2,998.20
meetings, conferences, etc.	169.60
gasoline for automobiles	924.47
Freight, express and parcel post	24.18
Publications, bulletins, annual reports	12.00
lithographing, engraving, etc.	2.00
Fuel	106.25
Electricity	303.31
Furniture and fixtures, new	137.02
repairs	1.25
Library, books and periodicals	83.26
binding	57.10
Scientific equipment, new	48.82
Automobile supplies	1.95
repairs	577.75
Tools, machinery and appliances, new	1,343.60
repairs	27.40
Buildings and structures, new	211.11
repairs and alterations	228.79
Rental of land and buildings	31.00
Insurance	142.79
Miscellaneous contingent expenses	46.76
Total disbursements	$48,637.30
Balance on hand June 30, 1930	862.70
	$49,500.00

DEPARTMENT STAFF AND WORK

W. E. Britton, Ph.D., D.Sc., *State and Station Entomologist.*
B. H. Walden, B.Agr., *Photographic and General Work.*
M. P. Zappe, B.S., *Inspection and General Work.*
Philip Garman, Ph.D., *Research.*
Roger B. Friend, Ph.D., *Research.*
} *Assistant Entomologists.*

J. F. Townsend
B. W. McFarland
John C. Schread, M.S.
W. Theodore Brigham, B.S.
} *Technicians.*

J. Peter Johnson, B.S., *Deputy in Charge of Asiatic and Japanese Beetle Quarantines.*
John T. Ashworth, *Deputy in Charge of Gipsy Moth Control.*
James A. McEvoy, *Assistant in Gipsy Moth Control.*
Robert C. Botsford, *Deputy in Charge of Mosquito Elimination.*
Mrs. Gladys Brooke, B.A., *Secretary.*

H. W. Coley, Westport
A. W. Yates, Hartford
} *Apiary Inspectors.*

Mr. Walden has been in charge of the office during the absence of the Entomologist, and has done most of the photographic work of the department. He has also prepared several educational exhibits and has done considerable work in identifying insects and arranging the collection. He has continued his investigations on the life history of the imported currant worm, *Pteronidea ribesi* Scop.

Mr. Zappe has continued as chief nursery inspector and with his assistants has inspected all nurseries in the State, the number having increased to 302. All nursery stock imported into Connecticut from foreign countries has also been examined. In coöperation with Mr. Stoddard, of the Botany Department, he has visited several orchards to gather data on the prevalence and time of appearance of orchard insects, and has scored fruit at harvest time for several growers who desired to become members of the 90 Per Cent Club. Mr. Zappe made observations on the time of emergence of the apple maggot flies and helped prepare the directions for control issued by the Extension Service of the Connecticut Agricultural College. Mr. Zappe also worked with Mr. T. M. Cannon and other Federal agents, in the work of clean-up and enforcing the clean-up of cornfields on account of the European corn borer. In addition to these duties he has devoted considerable time to identifying insects and arranging Coleoptera in the Station collection.

Dr. Garman has devoted most of his efforts to the control of the Oriental peach moth, and especially to artificially rearing and liberating parasites. This work has been very successful and so far has been continued. He has found some time for the identification of mites and dragonflies, and has had charge of the Station apiary on the Station farm in Mount Carmel. He has also

given considerable attention to the subject of horticultural oil sprays.

Dr. Friend has given his chief attention to completing the studies on the imported birch leaf miner, *Fenusa pumila* Klug, and the results are now being prepared for publication. He has continued his observations and treatment of lawns with lead arsenate as a control of the Asiatic beetle, *Anomala orientalis*. His observations on the control of the squash-vine borer and the cabbage maggot have also been continued and a paper on the former will be published separately. During the year Dr. Friend has given instruction in entomology in Yale University, and has devoted considerable time to the Diptera in the collection.

Mr. Ashworth has been in charge of the gipsy moth suppression work and, with Mr. McEvoy and men, has scouted a large number of towns, creosoted the egg-clusters discovered, and sprayed around the infestations.

Mr. Johnson has had charge of the control and quarantine enforcement work against the Japanese beetle. Mr. Johnson has maintained an office at 492 Howe Street, Shelton, with a force of clerks and inspectors necessary to make the required inspections, issue certificates, patrol the main highways leading out of the quarantined area, scout for beetles during the beetle season, and visit growers and dig for grubs in regions suspected to be infested.

Mr. Botsford has maintained for the State the ditches cut in the salt marshes for the purpose of eliminating mosquitoes. He also makes preliminary surveys and estimates, advises property owners regarding mosquito elimination, and supervises new construction work. Considerable new work has been done in Old Lyme and Old Saybrook, and funds have been collected for similar work in Groton and Stonington.

Mrs. Brooke has continued to serve as Secretary to the Department, and during her vacation Mrs. A. D. McDonnell was employed for part-time to write letters and do the necessary record work. In October, Miss Betty Scoville was employed to assist in typing reports for publication.

Mr. Coley and Mr. Yates have continued to serve as apiary inspectors as in former years on a *per diem* basis.

Mr. McFarland has been employed as a technician and inspector on Asiatic beetle work. Messrs. Townsend, Schread and Brigham have been employed as technicians on the work of rearing and distributing parasites of the Oriental peach moth.

Messrs. A. F. Clark, Harold B. Bender, W. T. Rowe, and R. J. Walker were employed for varying periods during the summer months to assist Mr. Zappe in the annual inspection of nurseries.

Mr. Donald S. Lacroix, a graduate of the Massachusetts Agricultural College, and now a teacher of biology at Amherst, Mass., was employed from the middle of June until the end of August, and was assigned to duty at the Tobacco Substation at Windsor to make a survey of insects attacking the tobacco plants in the

tobacco fields of Connecticut. Mr. Lacroix is a trained entomologist and he collected insects and made notes and sent them to the office. The report of his work will be included in the report of the Tobacco Substation, and will certainly be of considerable help to tobacco growers.

Mr. Russell W. Gillespie, a student in Purdue University, was employed during his summer vacation to index literature and check over bulletins and journals preparatory to binding them.

Mr. Neely Turner, who is engaged in research on the horticultural oil sprays project of the Crop Protection Institute, has continued in the Department and been furnished office and laboratory facilities by the Station.

All members of the Department Staff and others mentioned above have given their best services and great credit is due them for the work accomplished.

The Entomologist has directed the research, inspection, control, and quarantine enforcement work, and has for the most part handled the correspondence. He has devoted considerable time to conferences and meetings concerning insect work. He continued to serve as chairman of the committee on horticultural oil sprays of the Crop Protection Institute, insect pest reporter in Connecticut for the Insect Pest Survey of the Federal Bureau of Entomology, chairman of the Tree Protection Examining Board of Connecticut, and Superintendent of the Connecticut Geological and Natural History Survey, and has devoted a certain proportion of his time to each of these matters.

The chief Departmental activities are described in greater detail in the following pages of this report.

Exhibits

Altogether, insect material was prepared for about a dozen exhibits during the season. Such material was shown at the Hartford Farm Bureau outing, August 4; New Milford Garden Club, September 2; Horticultural Exposition, Hartford, September 12-14; two exhibits at the Danbury Fair, October 6-10; and the meeting of Entomologists Working in Connecticut, Hartford, October 31. An exhibit was displayed at the annual Field Day on the Station Farm in Mount Carmel, August 20, and similar exhibits were displayed on five different occasions when groups held meetings at the Station.

New Equipment

Two new racks with special cages for rearing grain moths, two incubators with thermo controls, eight cages for rearing *Macrocentrus* parasites in the greenhouse, and a large cage for emergence of *Macrocentrus* parasites have been constructed by our own technicians.

SUMMARY OF OFFICE AND INSPECTION WORK

462 samples of insects received for identification.
313 nurseries inspected.
302 regular certificates granted.
220 duplicate certificates issued for filing in other states.
7 special miscellaneous certificates granted.
120 nursery dealer's permits issued.
258 shipper's permits issued to nurserymen in other states.
307 parcels of nursery stock inspected and certified.
9 shipments of mountain laurel and other decorative material inspected and certified.
22,000 narcissus bulbs inspected and certified.
938 packages of shelled corn and other seeds inspected and certified.
243 blister rust control area permits issued.
64,239 Japanese beetle certificates issued for the shipment of nursery and floral stock and farm products.
1,950 Asiatic beetle certificates issued for the movement of soil and plants.
59 orchards and gardens examined.
20 shipments containing 213 cases and 1,851,300 plants of imported nursery stock inspected.
9 shipments or 45 per cent of imported nursery stock found infested.
1,059 apiaries, containing 10,335 colonies, inspected.
3 apiaries and 3 colonies found infested with European foul brood.
52 apiaries and 107 colonies found infested with American foul brood.
69 towns covered by gipsy moth scouts, 98 infestations found, 8,444 egg-clusters creosoted, 59 infestations spraved with 71,708 pounds lead arsenate, and 2,892 miles roadway and 156,670 acres of woodland scouted.
6,668[1] letters written on official work.
1,338 circular letters mailed.
163 post cards mailed.
20 reports issued to Federal Plant Quarantine and Control Administration.
2,751 bulletins, etc., mailed on request or to answer inquiries.
184 packages sent by mail or express.
72 lectures and addresses at meetings.

PUBLICATIONS OF THE DEPARTMENT, 1930

W. E. Britton
Twenty-Ninth Report of State Entomologist, Bull. 315, 142 pp., 16 plates, 14 figs. April, 1930.
Report of Committee on Injurious Insects, Proc. 39th Ann. Meeting, Conn. Pom. Society, 34, 3 pp. April, 1930.
Present Status of the Leopard Moth, *Zeuzera pyrina* Linn., in the United States. Trans. 4th Int. Cong. Ent., Vol. 2, 286, 4 pp. Jan., 1930.
Insects Injuring Vegetable Crops in 1929, Rept. Com. on Insects, Conn. Veg. Growers Asso., 48, 3 pp. 1930.
The Leopard Moth, Proc. 5th Nat. Shade Tree Conf., 75.
The Larch Case Bearer, Proc. 5th Nat. Shade Tree Conf., 68.
Better Care of Shade Trees, Tree Talk, 100, 2 pp. May, 1930.
Stone Quarries of Connecticut, Directory of the Rock Products Industry, 45. Jan., 1930.

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[1] Including 3,143 written from the Shelton office, and 88 written from the Danielson office.

The European Corn Borer Quarantine and Clean-up Regulations, Circ. 68, 7 pp., 1 fig. Jan., 1930.
Regulations Concerning the Transportation of Nursery Stock in the United States and Canada, Circ. 71, 29 pp. July 15, 1930.
Quarantine Regulations Affecting the Transportation of Nursery Stock in Connecticut, Circ. 72, 6 pp., 5 figs. July 15, 1930.
Quarantine Order No. 26, Concerning Plant Quarantine Regulations. 1 p. Aug. 5, 1930.
The Mosquito Problem of Connecticut and How to Solve it. (Revised Edition.) State Dept. of Health, 16 pp., 10 figs. Oct., 1930.

Philip Garman

The Oriental Peach Moth in Connecticut, Bull. 313. 57 pp., 12 plates, 9 figs. April, 1930.
Parasites for the Oriental Peach Moth, Proc. 39th Ann. Meeting, Conn. Pom. Soc., 39, 4 pp. April, 1930.
Oil Sprays in the East, American Fruit Growers' Magazine, Vol. 50, 5, 1 p. Feb., 1930.

M. P. Zappe

Observations on the Use of Iron Sulfate in Connecticut Orchards, Proc. 39th Ann. Meeting, Conn. Pom. Soc., 106, 4 pp. April, 1930.

R. B. Friend

The Asiatic Beetle, Monthly Bull. Calif. Dept. Agr., Vol. 19, 220, figs. 43-45, 3 pp. April, 1930.
The Spruce Gall Aphids, Proc. 5th Nat. Shade Tree Conf., 65, 2 pp.

R. C. Botsford

Anti-Mosquito Work in Connecticut in 1929, Proc. 17th Ann. Meeting, N. J. Mosq. Exterm. Asso., 145, 4 pp. 1930.

Neely Turner

The Place of Oil Sprays in Connecticut Orchards, Proc. 39th Ann. Meeting, Conn. Pom. Soc., 79, 2 pp. April, 1930.
Scientific Experimentation and Spray Problems, Proc. 5th Nat. Shade Tree Conf., 45, 3 pp.

ENTOMOLOGICAL FEATURES OF 1930

W. E. Britton

The growing season of 1930 was remarkable for its lack of rainfall. After a rather mild winter with neither low temperature nor heavy snowfall, the season opened with cool dry weather. In June, July, August and September, there was more than the usual amount of hot weather. In each of the months of April, June, July, August, September and October there was less than the normal amount of precipitation, the total shortage for the season amounting to more than 12 inches.

Undoubtedly, the weather has had considerable effect on the prevalence and scarcity of insect pests. The following brief notes constitute an insect pest survey of the season. The more important matters are described in greater detail in special articles and notes in the pages of this report.

Fruit Insects

The codling moth, *Carpocapsa pomonella* Linn., was present in about the usual numbers. As this insect is well controlled by the spray, injury was not prominent in well-sprayed orchards. Side injury caused by this insect was received from Cheshire, November 21, and a larva was received from Niantic, October 2.

Larvae of the fall cankerworm, *Alsophila pometaria* Harris, were observed in Cheshire and Plainville, April 9, but they were not very abundant and caused no damage in sprayed orchards.

The eastern tent-caterpillar, *Malacosoma americana* Fabr., was unusually scarce throughout the State, and only an occasional nest was seen.

The apple and thorn skeletonizer, *Hemerophila pariana* Clerck, was observed in a few instances, but this insect caused no injury.

The bud moth, *Tmetocera ocellana* Schiff., was scarce and caused only slight damage.

Leaf-rollers on apple were quite abundant in Milford and in some other localities. Specimens of the oblique-banded leaf roller, *Archips rosaceana* Harris, were received from Collinsville, May 21. Notes on other apple insects are as follows: The apple twig bark miner, *Marmara elotella* Busck, was received from Centerbrook, April 17; the yellow-necked caterpillar, *Datana ministra* Drury, from Middletown, July 30; the hag-moth, *Phobetron pithecium* S. and A., Watertown, September 11; and a cocoon of the cecropia moth, *Samia cecropia* Linn., from Mount Carmel, April 19; a scolytid larva in apple from Stratford, July 1.

The Oriental fruit moth, *Laspeyresia molesta* Busck, was generally less abundant and destructive than in 1929, although Mr. A. T. Henry states that the insect caused more damage in his orchard than last year. During the season parasites were reared at the Station, and about 4,000,000 *Trichogramma minuta* and 12,000 *Macrocentrus ancylivora* were liberated in 140 different orchards. Unquestionably these parasites helped reduce the percentage of wormy fruit. Peach twigs injured by the larvae of the Oriental fruit moth were received from Wethersfield, March 19.

The plum curculio, *Conotrachelus nenuphar* Herbst., was extremely abundant. It caused the most conspicuous injury present on fruit in apple orchards and its punctures were evident in all orchards throughout the State. This form of injury was particularly noticeable in one orchard near Rockville, where the crop was light. Work of this insect was received on apple from Norwalk, July 14, from Glastonbury, August 19, and on peach from New Haven, June 28.

The New York weevil, *Ithycerus noveboracensis* Forst., caused some injury to young apple trees in Hamden by eating the bark and leaves in May. Specimens were received May 28.

Considerable injury was caused to pears on Cook Hill, Bran-

ford, in August, by the quince curculio, *Conotrachelus crataegi* Walsh. The larvae eat holes in the pulp of the fruit just under the skin.

The round-headed apple borer, *Saperda candida* Fabr., was received from Centerbrook, April 17.

Leafhoppers were very abundant in apple orchards, especially late in the season. In May and June, leafhoppers seemed no more common than usual, but before harvest time they were exceedingly plentiful, and in some cases the fruit was stained by the excrement. In a season of normal rainfall some of the excrement usually is washed off by the rain and some of the leafhoppers are killed by a fungous disease. There are several species of leafhoppers on apple trees. Apparently the most important are *Empoasca fabae* Harris (formerly known as *E. mali* LeB.), and *Empoa rosae* Linn. The latter is the species that most noticeably injures the foliage and covers the fruit with excrement.

The apple redbug, *Lygidea mendax* Reut., was very scarce and caused no injury, although traces of its work were observed at Milford.

Peaches that had been injured by one of the plant bugs were received at the Station on August 26.

Apple aphids were unusually scarce during the season of 1930. The green apple aphid, *Aphis pomi* DeGeer, remained scarce throughout the season. A few were observed in Cheshire and North Haven, April 19, and at Storrs, June 5. The rosy apple aphid, *Anuraphis roseus* Baker, was also scarce. A few were observed early in the season at Bantam, Milford, Rockville and Storrs, and specimens were received from Glastonbury, August 18. However, there were practically no aphid apples at harvest time.

Although no longer a prominent orchard pest in Connecticut, the San José scale, *Aspidiotus perniciosus* Comst., occurs here and there. It was observed on apple fruit in New Haven and infested apple twigs were received from New Haven, October 6.

The pear psylla, *Psylla pyricola* Forst., was rather abundant, although probably somewhat less troublesome than usual, at least much less troublesome than in 1927.

The pear midge, *Contarinia pyrivora* Riley, was received from Mystic, May 29. This insect was also reported as causing considerable injury to pears in Branford.

The apple maggot, *Rhagoletis pomonella* Walsh, was present in about the usual numbers. The Extension Service sent out recommendations for treatment based on the appearance of the adult flies as observed by Mr. Zappe. The results were so satisfactory that a continuance of the service has been requested. Infested fruit was received from East Granby, November 6, 1929, and from Saugatuck, October 25.

The raspberry fruit worm, *Byturus unicolor* Say, was rather

more prevalent than usual, and specimens causing injury were received from Branford, May 23, and from West Cheshire, June 2.

The strawberry weevil, *Anthonomus signatus* Say, was reported as destroying three-fourths of the crop on a field in Branford. Specimens were received from Branford, May 26.

The European red mite, *Paratetranychus pilosus* C. and F., though present caused no injury to foliage during the summer. The eggs were rather plentiful in early spring, and again this fall were quite abundant in some orchards. This pest was observed in Cheshire, Storrs, Wilton, and Woodbridge.

The following notes on insects injuring grape are of interest: The European fruit scale, *Lecanium corni* Bouché, on grapevines was received from Waterbury, June 12, and from Bridgeport, November 21; the grape plume moth, *Oxyptilus periscelidactylus* Fitch, from New Haven and West Haven, May 22; the grape tube gall, *Cecidomyia viticola* S. and A., West Haven, August 5; the abbot sphinx, *Sphecodina abbotii* Swains., New Haven, July 18; the pandorus sphinx, *Pholus pandorus* Hubn., North Haven, August 26, Norwalk, August 28, and Rocky Hill, August 29; the spotted grapevine beetle, *Pelidnota punctata* Linn., Meriden, July 21, Hamden, and Danbury, August 25; and a leaf miner, *Antispila viticordifoliella* Clem., from Bridgeport, August 18.

Vegetable Insects

Both wireworms and cutworms were present and caused about the usual amount of injury to vegetable crops.

The cabbage root maggot, *Hylemyia brassicae* Bouché, although perhaps less abundant than last year, was present in most plantations, and caused considerable injury.

Severe injury by the seed corn maggot, *Hylemyia cilicrura* Rond., was reported as follows: corn at Milford, June 7, and lima beans at Windsor, June 19, where all except one row had to be replanted. In several tobacco fields, newly-set tobacco plants were seriously injured by this insect, but many growers attributed the cause to wireworms. As wireworms were often present in such cases, it is difficult to estimate the damage caused by the maggots. In 1921, we recorded similar injury to tobacco plants on sod land where clover had been plowed under.

The carrot rust fly, *Psila rosae* Fabr., was present and caused considerable injury to parsnip and carrot crops.

The spinach leaf miner, *Pegomyia hyoscyami* Panz., although present in some plantations, was not generally injurious in 1930. Specimens were received from New Haven, June 3, and from Bridgeport, June 9.

The cabbage worm, *Pontia rapae* Linn., was very abundant in the northern and central portions of the State and probably throughout the State.

The corn ear worm, *Heliothis obsoleta* Fabr., was more abundant than usual throughout the State and caused considerable injury to sweet corn. Specimens were received from Derby, July 18; New Haven, July 23 and September 4; Bristol, August 15; Colebrook, September 19, and Cobalt, October 1. Mr. Wilkinson of the Extension Service also reported it from Highwood, Middlefield and North Haven, July 28.

The stalk borer, *Papaipema nitela* Guen., was present everywhere in normal numbers and caused the usual amount of injury by tunneling in all kinds of herbaceous stems and injuring a plant here and there. Specimens were received in corn from Hartford, June 26; Hamden, June 27; Rainbow, July 8 and Brooklyn, August 1; in dahlias, from New Haven, August 12, and in ragweed from Westport, September 2.

The European corn borer, *Pyrausta nubilalis* Hubn., continued to spread, and during the scouting season of 1930, was found in 45 additional towns, most of which were apparently infested with the two-generation corn borer. This pest will probably soon spread over the entire State.

The margined blister beetle, *Epicauta marginata* Fabr., was received from West Haven, feeding upon beets, August 2, and from New London, feeding upon beans, August 30.

The Colorado potato beetle, *Leptinotarsa decemlineata* Fabr., was apparently less abundant than usual, especially in East Hartford, Hamden and Windsor, and certain potato fields were not injured, although not even sprayed or dusted.

The striped cucumber beetle, *Diabrotica vittata* Fabr., was present in great abundance as usual. Heavily dusting the young plants with lead arsenate and lime will control this insect.

The twelve-spotted cucumber beetle, or southern corn root worm, *Diabrotica 12-punctata* Fabr., was evidently very abundant in 1930. Specimens were received on corn from Southington, June 27, and from Forestville, August 5. It was also received October 11 from Grove Beach, where the beetles were devouring the late blossoms on gladiolus and dahlia.

The squash lady beetle, *Epilachna borealis* Fabr., was not especially abundant or troublesome. A large number of adults was received from Milldale, September 4.

The Mexican bean beetle, *Epilachna corrupta* Muls., has now spread into all sections of the State, although perhaps it is not present in every bean patch. Mr. Wilkinson reported that this insect literally covered the bean plants on about 250 poles at Norwich on August 5. During the season, specimens were received as follows: from Norwalk, July 8; Watertown, New Canaan, July 16; Granby, July 18; Shelton, Wallingford, Beacon Falls, July 26; Old Lyme, July 31; Brooklyn, Meriden, August 1; Southington, August 8; Hamden, August 11 and 12; New Haven,

September 15; Cobalt, October 1; Shelton, October 6; and Naugatuck, October 10.

The flea beetle, *Epitrix cucumeris* Harris, was abundant as usual and caused considerable injury to potato, tomato, tobacco and certain other plants. Mr. Wilkinson reported considerable damage by a late brood to potato fields in Highwood, Marion, Milford, North Haven and Orange, late in July, and less damage in Durham, Middlefield, and around Middletown, according to Mr. Lacroix. Flea beetles were present throughout the season in the tobacco fields, on Havana and shade-grown tobacco and also on broad leaf plantations, but the most serious injury occurred late in July, under cloth. Spraying heavily with lead arsenate and Bordeaux mixture, or dusting with cryolite, will control flea beetles, and the writer has discouraged them on tomato plants in the garden by spraying with Black Leaf 40 and soap.

The squash bug, *Anasa tristis* DeGeer, was usually present, but only in small numbers.

The pink and green potato aphid, *Macrosiphum solanifolii* Ashm., was reported July 28 by Mr. Wilkinson as being quite common on potato and tomato throughout New Haven County and to some extent in Middlesex County.

Shade and Forest Tree Insects

The European pine shoot moth, *Rhyacionia buoliana* Schiff., is now quite prevalent, especially in the southwestern portion of the State. It is found chiefly on red pine, but also attacks Scotch, Austrian and Mugho pines. Specimens were received from New Haven, May 13, and September 16; Greenwich, July 9; and Ridgefield, November 18. A closely related species, *R. comstockiana* Fern., was received from Bristol, May 23.

The white pine weevil, *Pissodes strobi* Peck, occurs throughout Connecticut, and causes considerable damage each year to young white pines. When shaded by other trees, the attack and injury are very much less severe, and often negligible. Specimens were received in white pine from Woodbridge, July 10; Waterbury, July 15; New Britain, July 24; in Douglas fir from Woodbridge, July 10; in spruce from Greenwich, July 14; and in Austrian pine from Cheshire, August 19. Possibly the last three may be some other species, as *P. approximatus* Hopkins, was received from Chaplin, September 18.

The twig borer, *Hypermallus villosum* Fabr., has evidently been rather prevalent during the season. Specimens were received in oak from New Haven, July 9; Bridgeport, July 14; Southbury, August 1; Groton, August 5, and Darien, August 28, and in red maple from Hartford, July 14.

The hickory stem girdler, *Oncideres cingulatus* Say, completely

girdled the branches of hickory trees in a nursery in New Haven, an unusual occurrence in Connecticut.

The leopard moth, *Zeuzera pyrina* Linn., was received in elm from Seymour, May 22, and Greenwich, June 20, and in maple from South Manchester, October 15.

One of the bark beetles, *Ips pini* Say, was received from Watertown, June 3, where hundreds of larvae and some adults were found under the bark of *Pinus ponderosa.* Another bark beetle, *Pityogenes hopkinsi* Swain., in white pine was received from Mansfield Center, on February 3.

The bronze birch borer, *Agrilus anxius* Gory, has killed many European white birch trees in Connecticut, especially the cut-leaf form. Specimens of this insect were received from New Canaan, July 11.

Cankerworms were apparently less abundant than for several seasons and no prominent stripping was noticed. Eggs of the fall cankerworm, *Alsophila pometaria* Harris, were received from Westbrook, March 8, and caterpillars of the spring cankerworm from New Haven, May 19.

The fall webworm, *Hyphantria cunea* Drury, was abundant on shade and forest trees, especially in the central and eastern portion of the State.

Leaf rollers were very abundant and oak trees were defoliated by them in Bethany, Hamden, Hebron, Marlborough, Middlefield, Watertown and Woodbridge. At least two species were reared from material collected at Watertown: *Tortrix quercifoliana* Fitch and *Tortrix albicomana* Clem. Specimens of the former on oak were received from Branford, July 5; *Tortrix fervidana* Clem. on oak was received from New Haven, July 21.

The white-marked tussock moth, *Hemerocampa leucostigma* S. and A., was rather more abundant than usual. Specimens of eggs were received from Hartford, February 25, and Waterbury, April 18, and larvae from New Haven, July 17, and Noank, September 10. The hickory tussock moth, *Halisidota caryae* Harris, on pecan was received from Noank, September 10.

An infestation of the satin moth, *Stilpnotia salicis* Linn., was discovered in Waterbury. Specimens were received from there on June 16 and 18, and Dr. Friend visited the region, and found that the poplar trees within a diameter of half a mile in the northeastern portion of the city were infested.

The elm leaf beetle, *Galerucella xanthomelaena* Schr., was more abundant and caused more injury in 1930 than for several years. Particularly through the southern central portion of the State, many of the unsprayed trees were brown in August. Inquiries were received from Guilford, Mystic, Old Mystic, Thomaston and Wallingford. Specimens were received from Guilford, July 21, and from Litchfield, August 23.

An outbreak of the saddled prominent, *Heterocampa guttivitta*

Walker, occurred during the season on the wooded elevations of Canaan and Norfolk, extending into Berkshire County, Massachusetts. The caterpillars fed chiefly upon beech and maple, and areas of several hundred acres were defoliated. Feeding with these caterpillars on maple but in smaller numbers were green-striped maple worms, *Anisota rubicunda* Fabr. Specimens of the green-striped maple worm were received from Norfolk, August 1, and of the saddled prominent from Norfolk, July 26 and August 4, and from East Canaan, August 13.

LeConte's sawfly, *Neodiprion lecontei* Fitch, was received from East Hartland, August 5, feeding on pine and with it another sawfly, a species of *Itycorsia;* also *Itycorsia* on Mugho, Scotch and red pine came from Thompsonville, November 13.

The walking stick, *Diapheromera femorata* Say, was reported as defoliating oak trees in Voluntown late in the season. Specimens of this insect were received from Hamden, August 8, and from New Haven, August 19 and September 9.

The oak blotch leaf miner, *Lithocolletes hamadryadella* Clem., was observed in a few places in the State, and specimens were received from Norwalk, August 1.

The birch sawfly leaf miner, *Fenusa pumila* Klug, was present everywhere throughout the State on the young leaves of gray birch and the European white birch, especially the cut-leaf form. It also infested to a lesser extent the paper or canoe birch.

The elm leaf miner, *Coleophora limosipennella* Dup., was received from Branford, July 17.

The larch case bearer or leaf miner, *Coleophora laricella* Hubn., was received from New Haven, May 22.

There was an outbreak of Comstock's mealy bug, *Pseudococcus comstocki* Kuwana, on catalpa street trees in the northwestern portion of New Haven. Probably it will be necessary to spray these trees next season. Specimens of this species were received from New Haven, September 3, and similar and probably the same species from Norwalk, May 21; Fairfield, September 24, and Hartford, September 26.

The elm scale, *Gossyparia spuria* Mod., was received from Cheshire, June 10.

The hickory leaf stem gall aphid, *Phylloxera caryaecaulis* Fitch, was received from Redding, June 16, and *P. caryae globuli* Walsh, was received from Norwalk, May 29.

The pine leaf scale, *Chionaspis pinifoliae* Fitch, is quite common on various species of pines growing in protected situations. Specimens were received as follows: on red pine, Old Lyme, November 6, 1929; on Japanese black pine, Branford, January 16; on Scotch pine, Watertown, March 7; East River, April 4; Berlin, May 12 and Hartford, April 16.

The tulip tree scale, *Toumeyella liriodendri* Gmel., was received from New Haven, December 27, 1929; Branford, January 4;

Bridgeport, January 7; Greenwich, February 11, and Southington, August 4.

The oyster-shell scale, *Lepidosaphes ulmi* Linn., was received on poplar from Fairfield, November 18, 1929; on ash from Rockfall, May 19, and on willow from Hartford, September 8.

The woolly maple leaf scale, *Phenacoccus acericola* King, was received from Middletown, January 16; New Haven, August 8; Hartford, September 10; Meriden, September 29, and Bridgeport, October 11.

The spruce gall aphids were prevalent though somewhat less abundant in nurseries than in 1929. Specimens of *Adelges abietis* Linn. were received from Fairfield, November 18, 1929; Meriden, January 16; West Cornwall, April 23; Watertown, June 12; Waterbury, East Haven, July 24; and Southport, September 13. The blue spruce gall aphid, *Gillettea cooleyi* Gill., was much less prevalent than in 1929. Specimens were received from New Milford, July 30, and from Norfolk, August 19. The pine bark aphid, *Adelges pinicorticis* Fitch, was present as usual and specimens were received from Litchfield, August 16.

The spruce mite, *Paratetranychus ununguis* Jac., was rather prevalent. Specimens were received from Beacon Falls, June 27; Old Lyme, July 8; and Southport, December 2.

The common red spider of trees, *Tetranychus bimaculatus* Harv., was also present, and specimens were received from North Haven, June 2.

The maple leaf bladder gall, *Phyllocoptes quadripes* Shimer, was abundant on silver maple and specimens were received from Winsted, June 3; Torrington, June 4; Salisbury, June 6; Cheshire, June 12; Bantam, June 13, and Middletown, July 17.

Other mite injuries on trees are: *Eriophyes fraxiniflora* Felt, on ash from Niantic, November 14; *Eriophyes* sp., on boxelder from Guilford, August 5; and on Juglans from Norfolk, September 5.

Insects of Ornamental Shrubs and Vines

Mealy bugs, *Pseudococcus* sp., were received from Middlebury, May 20, on *Taxus baccata;* from Hartford, September 26, on trumpet creeper; and from West Hartford, April 25, on box (*Buxus* sp.).

The juniper scale, *Diaspis carueli* Targ.-Tozz., has been rather abundant and specimens on different horticultural varieties of juniper have been received as follows: Manchester, December 11, 1929; Greenwich, May 20; Noroton, September 13, and Rockville, October 4.

The oyster-shell scale, *Lepidosaphes ulmi* Linn., was received on box (*Buxus*) from Middlebury, June 2.

The euonymus scale, *Chionaspis euonymi* Comst., was received from Norwalk, August 13, and from New Haven, October 2.

The rhododendron lace bug, *Leptobyrsa explanata* Horv., has been rather prevalent on rhododendrons, and specimens were received from Southport, July 11.

Several inquiries have been received regarding the juniper webworm, *Dichomeris marginellus* Fabr., which has seriously injured low juniper in ornamental plantings. Spraying with lead arsenate during the summer is the remedy. Specimens were received from Meriden, June 9.

There has been considerable injury to Taxus plants in nurseries and ornamental plantings from the attacks of the black vine weevil, *Brachyrhinus sulcatus* Fabr. The larvae feed upon the bark of the roots. In a few cases lead arsenate has been applied to the soil with beneficial results. Specimens were received from Greenwich, August 7.

The Japanese beetle, *Popillia japonica* Newman, will cause injury to many different kinds of shrubs and vines when it becomes abundant. A single specimen from rose was received from Terryville, September 10.

Honeysuckle vines are sometimes partially or wholly defoliated by the larvae of certain species of sawflies. Specimens, *Abia* sp., were received from East Haven, June 17.

Insects of Flowers and Greenhouse Plants

The cyclamen mite, *Tarsonemus pallidus* Banks, continues to cause much injury to certain kinds of plants in the greenhouse and garden. Especially cyclamen, snapdragon, and chrysanthemum are injured in the greenhouse, and larkspur and snapdragon in the garden. Specimens were received from Branford, November 25, 1929, on cyclamen; from Storrs, June 16, on strawberry, and from Shelton, December 15, on snapdragon.

The bulb mite, *Rhizoglyphus hyacinthi* Banks, causes considerable injury to various kinds of bulbs, and specimens on Bermuda lily were received from Storrs, January 29.

Mealy bugs, *Pseudococcus* sp., often cause much injury to greenhouse plants, and certain species are occasionally found in the garden. Specimens on gladiolus corms were received from New Haven, May 7.

The garden millipede, *Julus hortensis* Wood, with injured plants of pansy and lupine were received from Riverside, June 7.

A small leaf beetle, *Nodonota puncticollis* Say, feeding upon rose leaves, was received from Canaan, June 27.

The rose stem girdler, *Agrilus viridis* var. *fagi* Ratz., which forms galls on rose stems, has become very prevalent on *Rosa rugosa* and *Rosa hugonis,* and was found in 24 nurseries when the

annual inspection was made. Specimens were received from Litchfield, October 15, on *Rosa rugosa.*

Wireworms, *Limonius* sp., injuring iris rootstocks were received from New Haven, April 28.

The iris borer, *Macronoctua onusta* Grote, tunnels in the rootstocks of iris, and specimens were received from New Haven, August 8.

The 12-spotted cucumber beetle, *Diabrotica 12-punctata* Oliv., which is usually a minor pest of vegetable crops, was reported as being very abundant at Grove Beach late in the season and feeding upon the flowers of late-blooming dahlia, gladiolus and other plants. Specimens were received October 11.

Stored Grain and Household Insects

The angumois grain moth, *Sitotroga cereallela* Oliv., is a common pest of stored grain, especially corn. This is the species that is now reared in great numbers in cages for the purpose of obtaining the eggs to be used in rearing the parasite, *Trichogramma minuta* Riley. Specimens of popcorn infested by the angumois grain moth were received from Meriden, December 17, 1929.

The drug store beetle, *Sitodrepa panicea* Linn., infests all sorts of stored spices and plant products. Specimens were received from Bridgeport, October 10.

The Indian meal moth, *Plodia interpunctella* Hubn., which commonly infests stored cereals, was received from Cheshire, February 24.

The confused flour beetle, *Tribolium confusum* Duval, also infests stored cereal foods, and specimens were received from New Haven, January 23, and from Hartford, November 14.

The cadelle, *Tenebroides mauritannicus* Linn., which also infests stored cereal products, was received in macaroni from Hartford, October 27.

The large cabinet beetle, *Trogoderma tarsale* Melsh., frequently injures stored seeds. Specimens were received from New Haven, January 23.

The buffalo or carpet beetle, *Anthrenus scrophulariae* Linn., often infests carpets and woolen clothing. Specimens were received from West Haven, November 30, 1929; Torrington, August 29; and New Haven, October 7.

The black carpet beetle, *Attagenus piceus* Oliv., often injures wool clothing in closets, feathers in pillows, and carpets. The slender larvae feed upon the lint in cracks of floors and have been known to breed in flour and meal. Specimens were received from Torrington, August 29.

The white-marked spider-beetle, *Ptinus fur* Linn., occasionally infests and injures dried animal specimens in museums, wool,

furs, clothing and dried plants. Specimens were received from Hartford, November 30, 1929.

The case-making clothes moth, *Tinea pellionella* Linn., is one of the common moths that injure clothing in dark closets. Specimens were received from South Norwalk, December 8.

Several larder beetles of the genus *Dermestes* sometimes injure ham, dried meats, skins, cheese and other animal products. The most common of these beetles is *Dermestes lardarius* Linn. On December 3, specimens of another species were received from South Norwalk, where they were found in a dwelling house. These proved to be *Dermestes nidum* Arrow (*elongatus* LeC.), a species occupying birds' nests in the southern and western states. This is the first record for Connecticut.

Slender elongated and flattened insects called fish moths, silver fish, or bristle-tails often injure books and other objects in houses by eating the paste. The common species are *Lepisma saccharina* Linn. and *Thermobia domestica* Pack. Specimens were received from Glenbrook, July 18, and from Milldale, August 2, but in both cases the material was crushed beyond specific identification.

There were many reports and inquiries regarding fleas in houses during the summer. In most cases the common cat and dog flea, *Ctenocephalus canis* Curt., is responsible. Specimens of this flea were received from Norwalk, July 19, and from Fairfield, July 24.

Occasionally in spring and late fall the porch or side walls of a house will be found overrun by small reddish mites. Those in the spring have just hatched from the eggs, and those in the fall are probably seeking a sheltered place to deposit their eggs. Sometimes they crawl into the living rooms but do not long remain there. I once saw an open cellar window where the winter supply of coal had been put in filling the bin up to the window ledge. Some of the pieces of coal were literally covered with eggs and had such a marked red color that it could be detected at a distance. This is the clover mite, *Bryobia praetiosa* Koch; specimens were received from New Britain, May 15, and from Hartford, December 9.

Field and Lawn Insects

The Asiatic beetle, *Anomala orientalis* Waterhouse, has been abundant in the infested area of New Haven, though on account of the drought, the grubs went deeper into the soil and really did less feeding near the surface. Many property owners have now applied lead arsenate to their lawns. This insect has now been found in a few places outside the quarantined area. Specimens were received from New Haven, July 31. Specimens of *Anomala* (not *A. orientalis*) were received from Hamden, November 12, 1929.

White grubs, *Ligyrus* sp., were received from New Haven, in compost, June 28, and in soil June 30.

The chinch bug, *Blissus leucopterus* Say, according to Dr. E. P. Felt, has been responsible for causing brown patches in lawns in Greenwich, Conn., and Port Chester, N. Y. Some of these patches were 25 to 40 feet in diameter.

The army worm, *Heliophila unipuncta* Haw., was present although no particular injury was reported. Specimens were received from Berlin, July 22, and from New London, August 30.

The tarnished plant bug, *Lygus pratensis* Linn., was very abundant in the tobacco fields of Windsor and adjoining towns, although it did not cause serious injury. Some wilted tobacco tips were observed July 3.

Miscellaneous Insects

Specimens of the common white ant, *Reticulitermes flavipes* Kollar, were received from Greenwich, May 27. These were adults and many of them had the wings broken off, as is their habit after swarming.

The woodwork of houses, furniture and utensils is often tunneled and injured by small beetles of the family *Ptinidae,* commonly called powder-post beetles. One species, *Ptilinus ruficornis* Say, in a wooden bobbin or spool was received from Rocky Hill, December 21, 1929.

The brilliant green-gold beetle, *Chrysochus auratus* Fabr., was fairly common and was sent in by correspondents who thought it was the Japanese beetle. This insect is much smaller than the Japanese beetle, and it feeds upon milkweed and dogbane. Specimens of this beetle were received from Wallingford, June 18; from Norwalk, July 19, and from Waterbury, August 15.

The Japanese beetle, *Popillia japonica* Newman, was more abundant in Hartford than in 1929, and during the beetle season 103 towns were scouted. Beetles were found for the first time in Branford, Danbury, Enfield, Groton, Meriden and Terryville.

In September there was a swarm of cotton moths, *Alabama argillacea* Hubn., in Bridgeport and some other cities and towns. In Bridgeport they were very abundant and fairly covered some of the store windows. We did not notice them in New Haven, but two sets of specimens were received from Bridgeport, September 27, and one from Greenwich, September 29.

Convention of Entomologists Working in Connecticut

The seventh annual convention of Entomologists Working in Connecticut was held in the Old Senate Chamber, State Capitol, Hartford, on Friday, October 31, 1930. These meetings are held to bring together for discussion all official entomologists employed by the State and the United States Department of Agriculture, as well as teachers and amateur collectors. Entomologists from

the adjoining states were invited. Subjects of vital importance to Connecticut were given a prominent place on the program, and several Federal entomologists were invited to address the conference. The following from outside of Connecticut presented papers: Lee A. Strong, Washington, D. C.; C. H. Hadley, Camden, N. J.; L. H. Worthley, Boston, Mass.; A. F. Burgess, Melrose Highlands, Mass.; and Donald S. Lacroix, Amherst, Mass. About 72 persons attended the conference. The following program was carried out without a single substitution, except that on account of sickness Governor Trumbull was unable to be present.

Program

A. M.

10:30 Greeting, His Excellency, John H. Trumbull, Governor

10:40 Qualifications and Training of Men for Agricultural Research
Director William L. Slate, Connecticut Agricultural Experiment Station

10:55 Prominent Entomological Features of the Season
M. P. Zappe, Connecticut Agricultural Experiment Station

11:10 The Need of Organized Control of Plant Pests
Hon. S. McLean Buckingham, Commissioner of Agriculture, Hartford

11:20 Certain Aspects of Federal and State Coöperation in Pest Control
Lee A. Strong, Chief, Plant Quarantine and Control Administration, Washington, D. C.

11:50 Observations on Ant Lion Colonies
B. H. Walden, Connecticut Agricultural Experiment Station

12:00 The Present Situation as Regards the Japanese Beetle in the United States
C. H. Hadley, In Charge, Preventing Spread of Japanese Beetle, Camden, N. J.

P. M.

12:30 Luncheon

1:45 Control of the Squash Vine Borer
R. B. Friend, Connecticut Agricultural Experiment Station

2:00 Survey of Corn Borer Conditions in the United States
L. H. Worthley, Administrator, Corn Borer Control, Boston

2:20 Results of Scouting and Road Patrol in Connecticut
H. N. Bartley, South Norwalk

2:30 Shade Tree Insects and Control Methods
E. P. Felt and Stanley W. Bromley, Stamford

3:00 Rearing and Liberating Parasites to Control the Oriental Fruit Moth
Philip Garman, Connecticut Agricultural Experiment Station

3:15 Present Status of the Gipsy Moth and the Satin Moth in New England
A. F. Burgess, In Charge of Moth Control, Melrose Highlands, Mass.

3:45 Early Entomological Work in Connecticut
W. E. Britton, Connecticut Agricultural Experiment Station

4:00 Some Entomological Observations, South, West and East
R. M. DeCoursey, Connecticut Agricultural College

P. M.

4:10 Insects in the Children's Museum
J. S. Miller, Hartford

4:25 Progress in Mosquito Elimination Work in Connecticut
R. C. Botsford, Connecticut Agricultural Experiment Station

4:40 Progress in Controlling the White Pine Blister Rust in Connecticut
J. E. Riley, Jr., Connecticut Agricultural Experiment Station

4:55 Insects Injuring Tobacco in Connecticut in 1930
Donald S. Lacroix, Amherst, Mass.

The following were present: Dorothy Amrine, New Haven; John T. Ashworth, Danielson; H. N. Bartley, Norwalk; John H. Belden, Hartford; H. L. Blaisdell, Melrose Highlands, Mass.; R. C. Botsford and W. E. Britton, New Haven; Stanley W. Bromley, Stamford; Gladys Brooke, New Haven; S. McLean Buckingham, Hartford; A. F. Burgess, Melrose Highlands, Mass.; G. W. Burke, Shelton; T. M. Cannon, Hartford; V. L. Churchill, New Haven; C. W. Collins, Melrose Highlands, Mass.; O. B. Cooke, Danielson; R. G. Cooper, Colebrook; E. B. Davidson, Storrs; R. M. DeCoursey, Storrs; Charles M. Dittrich, Jr., and B. M. Ellis, Storrs; C. M. Emerson, East Hartford; E. P. Felt, Stamford; B. J. Fitzsimmons, Jr., Storrs; R. B. Friend, New Haven; C. W. Frink, Willimantic; Philip Garman, New Haven; R. D. Glasgow, Albany, N. Y.; C. H. Hadley, Camden, N. J.; Kenneth N. Hanks, Storrs; A. F. Hawes, Hartford; S. P. Hollister, Storrs.

C. E. Hood, Melrose Highlands, Mass.; C. E. Jennings, New Haven; J. Peter Johnson, Shelton; J. F. Keough, Willimantic; Dolor LaBelle, Ballouville; Donald S. Lacroix, Amherst, Mass.; G. H. Lamson, Storrs; J. B. Lewis, Southington; J. W. Longo, Danielson; J. A. Manter, Storrs; J. A. McEvoy, Putnam; B. W. McFarland, New Haven; H. L. McIntyre, Albany, N. Y.; Dorothy E. Miller, Meriden; J. S. Miller, Hartford; E. S. Peterson, Shelton; Saul Phillips, Albany, N. Y.; C. E. Pinckney, Jr., Storrs; H. A. Preston, East Hartford; J. E. Riley, Jr., and R. M. Ross, New Haven; J. V. Schaffner, Jr., Melrose Highlands, Mass.; John C. Schread, New Haven; Frank R. Shaw, Belchertown, Mass.; M. T. Smulyan, Melrose Highlands, Mass.; Lee A. Strong, Washington, D. C.; J. F. Townsend, New Haven; Ethel Usher, Hartford; B. H. Walden, New Haven; R. L. Walker, Storrs; George S. Wheeler, Shelton; E. H. Wilkins, Hartford; A. E. Wilkinson, Storrs; L. H. Worthley, Boston, Mass., and M. P. Zappe, New Haven.

INSPECTION OF NURSERIES IN 1930

W. E. Britton and M. P. Zappe

In 1930, the annual inspection of nurseries, as provided in Sections 2136-2140 of the General Statutes (revision of 1930), was commenced July 1 and completed October 1 except for a few nurseries that were not registered before July 1. This work was in charge of Mr. Zappe, who was assisted by A. F. Clark, W. T. Rowe, R. J. Walker, and H. B. Bender. In a few special cases, inspections were made by B. W. McFarland, R. C. Botsford, A. A. Dunlap, B. H. Walden, J. P. Johnson, E. M. Stoddard, and W. E. Britton.

Mr. Bender, formerly a member of the Botany Department, was employed during the month of July in order to give particular attention to such plant diseases as might be found in the larger nurseries. Dr. Dunlap, his successor in the Botany Department, also helped inspect some of the nurseries during August.

As heretofore, the blister rust scouts, under Mr. Riley, examined all nurseries where the presence of the white pine-currant blister rust was found by the nursery inspectors. Gipsy moth scouts were again instructed to search with particular thoroughness the region in and around each nursery, and to report to the office at once if any gipsy moth eggs were found in a nursery or in the neighborhood of a nursery. No such gipsy moth infestations were discovered, but the white pine blister rust was found in nine nurseries. This disease occurred on *Ribes* in seven nurseries and on white pine in three nurseries, one of them having it on both white pine and *Ribes*.

On the whole, the nurseries were in better condition than usual, due in part to the drought, which necessitated better cultivation and which was not conducive to the development of fungous diseases or the growth of weeds. Fungous diseases were less prevalent than in 1928 and 1929 and certain insects were likewise less abundant. For instance, aphids were less conspicuous in 1930 than usual and the spruce gall aphids were noticeably less abundant.

In 18 nurseries, no pests were found. Altogether, about 143 different insects and 95 plant diseases, a rather large number, were found in the nurseries, but it is not necessary to enumerate them here. Some of the more abundant and important pests with the number of nurseries in which each occurred are as follows:

Among the insects, oyster-shell scale (86) was found in more nurseries than any other insect pest, followed by the birch leaf miner, *Fenusa pumila* (74), spruce gall aphid (72), white pine weevil (66), aleyrodes (63), Oriental peach moth (41), catalpa leaf miner (40), apple woolly aphids (38), leafhoppers on apple (34), columbine leaf miner (32), lace bugs on rhododendron (31), fall webworm (29), blue spruce gall aphids, *Gillettea cooleyi* (27), pine bark aphids (26), elm aphids (25), rose aphids (24), green apple aphids (23), pear blister mite (21), European pine shoot moth (17), rose scale (17), elm scale (16), mites on silver maple (16), willow leaf beetle, *Plagiodera versicolora* (14), elm leaf beetle (14), mites on spruce (12), pine leaf scale (10), and *Ormenis pruinosa* (10).

Among the plant diseases found in nurseries in 1930, leafspot of rose heads the list, having been recorded from 155 nurseries, followed by leafspot on phlox (117), mildew of rose (106), mildew of phlox (96), leafspot of catalpa (93), leafspot of iris (87), leafspot of rhododendron (78), rust of apple (61), leafspot of Japanese maple (60), rust of Bechtel's crab (56), mildew of

catalpa (56), bacterial leafspot of larkspur (56), leafspot of maple (56), mildew of lilac (55), leafspot of mountain ash (52), leafspot of kalmia (51), poplar canker (35), leafspot of horse chestnut (33), rust of *Crataegus* (32), black rot of apple (31), mildew of grape (27), *Gnomonia ulmi* (23), leafspot of strawberry (22), maple tar spot (20), yellowing of lilacs (20), mildew of apple (19), rust of juniper (18), leafspot of ampelopsis (17), leafspot of rhubarb (16), entomosporium, quince (16), leafspot of peach (13), leafspot of paeony (12), leafspot boxelder (12), leafspot of viburnum (12), mildew, larkspur (11), and rust on hollyhock (11).

TEN-YEAR RECORD OF CERTAIN NURSERY PESTS

	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Oyster-shell scale	36	44	42	44	38	39	45	57	78	86
San José scale	28	19	20	32	32	19	16	30	22	8
Spruce gall aphids[1]	31	21	28	40	27	42	82	120	147	99
White pine weevil	1	19	17	5	5	8	17	19	37	66
Apple and thorn skeletonizer		1	18	2	8	9	22	49	20	3
Poplar canker	21	31	34	25	34	32	39	35	37	35
Pine blister rust (on *Ribes*)	2	9	6	8	7	9	9	5	7	7
Nurseries uninfested	36	36	32	33	34	46	37	18	13	18
Number of nurseries	94	101	106	116	151	162	191	228	266	302

It should be understood that the figures in the preceding table are not strictly comparable because of the greater number of nurseries since the new law went into effect in 1925. Thus though the number of infested nurseries is greater, the actual percentage may be considerably less.

Number and Size of Nurseries

The number of nurseries in Connecticut has increased each year. The list for 1927 contained 191 names. The list for 1928 contains 228 names, for 1929, 266 names and for 1930, 302 names. Of the 302 separate nurseries in the State, a classification on account of size may be made as follows:

Nurseries containing 50 acres or more	18
" " between 10 and 50 acres	32
" " " 5 and 10 "	41
" " " 2 and .5 "	71
" " 1 acre or less	140
	302

In 1930, 313 nursery inspections were made. The list of nursery firms receiving certificates contains 302 nurseries; 10 of these were new nurseries, registered in the winter, that were inspected twice, once in the spring and again in the fall.

[1] Includes both *Adelges abietis* and *Gillettea cooleyi*.

From the owners of five nurseries failing to register before July 1, as provided in Section 2137 of the General Statutes (revision of 1930), $25 was collected to cover the cost of inspection, and this amount was turned over to the Treasurer of the Station on December 8 to be sent to the State Treasurer. This cost of inspection would have been considerably greater had it been necessary to make a special trip from New Haven to inspect each nursery, but when several nurseries can be visited by the inspectors on a trip, the expense is proportioned between them.

The total area of nurseries in Connecticut in 1930 is about 3,655 acres, an increase of 500 acres over 1929. These figures in the main were taken from the estimates of the owners and managers as given on the registration cards, supplemented by the estimates of the inspector. Each nursery of less than an acre in extent is listed as one acre and where fractions are given, the next whole number is recorded. Certified nurseries now number 302, 48 new nurseries have been added during the year, and seven have discontinued the nursery business. Fifteen on last year's list are now given under different firm names. The nursery firms granted certificates in 1930 are as follows:

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1930

Name of firm	Address	Acreage	Certificate issued	Number certificate
Abeling, R. W.	Torrington	1	Sept. 19	1,254
Albrecht's Nursery (2)	Shelton	1	Sept. 29	1,295
Aldrich, Miss Inie E.	Thomaston	3	Sept. 25	1,281
Alius, Adolf	Stamford	1	Nov. 12	1,363
Allen, Henry L.	North Stonington	1	Aug. 28	1,182
Amato, John	Cromwell	1	July 23	1,102
Amelunxen & DeWyn	Yalesville	5	Sept. 18	1,247
Ampelopsis Nurseries	Groton	1	Aug. 28	1,186
Andover Gardens	Andover	2	July 25	1,107
Anstett, Louis	Norfolk	1	June 6	1,073
Arawana Nursery	Milford	1	Sept. 23	1,273
Artistree Nursery	Branford	2	Sept. 29	1,291
Austin, M. E.	Clinton	1	Aug. 30	1,193
Bacchiocchi, Joseph	Bridgeport	1	Oct. 22	1,349
Barnes Bros. Nursery Co.	Yalesville	200	Aug. 30	1,190
Barnes Eastern Nurseries	Wallingford	15	Aug. 14	1,146
Barnes Nursery & Orchard Co.	Wallingford	50	Oct. 8	1,319
Barry, Joseph E.	Hamden	1	May 29	1,072
Barton Nursery	Hamden	1	July 22	1,090
Beattie, William H.	New Haven	1	Sept. 20	1,259
Benbow, A.	Norfolk	1	Aug. 2	1,122
Bertana, Louis	Glenbrook	2	Aug. 28	1,173
Bertolf Bros., Inc.	Greenwich	40	Aug. 23	1,158
Blanchard & Co., L. N.	Stamford	2	Oct. 25	1,354
Bonnie Brook Gardens	Rowayton	2	Aug. 11	1,133
Booy, H. W.	Yalesville	4	Sept. 29	1,292
Botsford, R. C.	New Haven	1	Sept. 20	1,260

Name of firm	Address	Acreage	Certificate issued	Number certificate
Brainard Nursery & Seed Co.	Thompsonville	20	July 31	1,117
Braley & Co., S. A.	Burnside	1	July 22	1,088
Branford Nurseries	Branford	4	Sept. 19	1,249
Bretschneider, A.	Danielson	1	July 25	1,104
Bridgeport Hydraulic Co.	Bridgeport	50	Oct. 22	1,352
Brimfield Gardens Nursery	Wethersfield	8	Aug. 28	1,177
Bristol Nurseries, Inc.	Bristol	50	Sept. 4	1,205
Brooklawn Conservatories, Inc.	Bridgeport	1	Oct. 15	1,339
Brooklawn Nursery	Bridgeport	2	Oct. 15	1,336
Brouwer's Nurseries	New London	15	Sept. 27	1,288
Brown, E. M.	Hartford	7	Oct. 10	1,326
Bruce Nurseries	Danielson	1	July 25	1,105
Bubenicek, Joseph	Woodmont	1	Sept. 18	1,246
Bulpitt, Henry F.	Darien	4	Aug. 16	1,151
Bunting's Nurseries, Inc.[1]	Groton	2	Sept. 22	1,265
Burke, the Florist	Rockville	1	July 23	1,098
Burr & Co., Inc., C. R.	Manchester	600	July 25	1,103
Burr, Morris L.	Westport	1	Oct. 4	1,311
Burroughs, Thomas E.	Deep River	1	Aug. 14	1,144
Burwell, Ellsworth E.	New Haven	1	Sept. 19	1,255
Byram Evergreen Nursery	East Portchester	1	Sept. 4	1,204
Calvanese, John	Southington	1	Sept. 24	1,279
Candee, Hollis S.	Hartford	7	Sept. 3	1,201
Cant, Alexander	Springdale	1	Sept. 9	1,216
Cardarelli, Emilio J.	Cromwell	5	Aug. 13	1,139
Carey, Alice L.	Cheshire	1	Sept. 3	1,196
Cascio, Peter J.	West Hartford	2	Aug. 11	1,137
Case, Louis L.	Simsbury	1	Sept. 24	1,275
Chippendale Nurseries	Old Lyme	2	Sept. 13	1,231
Clark, Raymond H.	Milford	2	Aug. 5	1,127
Cleary, Arthur B.	Bethel	1	Aug. 26	1,166
Clinton Nurseries	Clinton	95	Oct. 17	1,341
Clyne Nursery Co.	Middlebury	7	Dec. 16	1,370
Conine Nursery Co.	Stratford	75	July 29	1,112
Conn. Agr. College (Prof. S. P. Hollister)	Storrs	1	July 25	1,108
Conn. Agr. Expt. Station (W. O. Filley, Forester)	New Haven	4	Sept. 29	1,299
Conn. Forestry Nursery	Deep River	9	Aug. 14	1,142
Conn. Valley Nurseries	Manchester	1	July 22	1,078
Cooper's	Bridgeport	1	Sept. 23	1,270
Corrigan's, West Haven Nurseries	West Haven	1	Aug. 26	1,164
Corsino, Antonio	Hartford	1	Sept. 29	1,294
Couture, E. R.	Westport	2	Oct. 14	1,333
Cragholme Nurseries, Inc.	Greenwich	8	Aug. 16	1,150
Cromie, G. A.	New Haven	2	Oct. 4	1,313
Cronamere Nurseries	Greens Farms	1	Sept. 20	1,258
Culver, W. B.	Suffield	1	July 22	1,081
Curtis, C. F.	Plantsville	2	July 22	1,096

[1] Home address, Selbyville, Del

Name of firm	Address	Acreage	Certificate issued	Number certificate
Dallas, Inc., Alexander..	Waterbury	2	Sept. 9	1,217
Damen, Peter J.[1]	Foxon	2	Oct. 7	1,316
Darien Nurseries, The ..	Darien	6	Aug. 28	1,178
Dawson, Wm. A.	Willimantic	2	Sept. 16	1,240
Daybreak Nurseries, Inc.	Westport	6	Sept. 16	1,241
DeCerbo, Meyer E.	Woodmont	1	Sept. 27	1,289
DeMars, F. H.	Winsted	1	Oct. 1	1,307
Devaney, Charles (2) ..	Pawcatuck	2	Nov. 6	1,360
Doebeli, Charles A.	Bridgeport	1	Sept. 16	1,239
Dondi, Augusto	Hamden	1	Nov. 19	1,366
Dougherty's Nursery ...	Yalesville	1	Sept. 24	1,276
Dowd, Inc., F. C.	Madison	1	Oct. 10	1,325
Dunlap's Hydrangea Nursery	Cromwell	3	July 23	1,100
Dunn, James F.	Stamford	3	Oct. 17	1,343
Eager, Edward M.	Bridgeport	1	Sept. 16	1,237
East Rock Nursery Co...	New Haven	1	Oct. 9	1,320
Elfgren & Sons, I. P. ...	East Killingly	2	Aug. 14	1,140
Ellington Nurseries	Ellington	1	July 22	1,089
Elm City Nursery Co., Woodmont Nurseries, Inc.	New Haven and Woodmont 140		Sept. 24	1,277
Elmgren, Clarence J. ...	Cromwell	1	Aug. 23	1,159
Elm Grove Cemetery Assn.	Mystic	1	Sept. 20	1,261
Evergreen Nursery Co...	Wilton	20	July 22	1,095
Eyberse & Sons, John ..	Norwich	1	Aug. 28	1,185
Fairty, C. H.	New Canaan	1	Oct. 11	1,327
Farmington Valley Nursery	Avon	5	Oct. 9	1,321
Fletcher, Walter L.	Hamden	15	Sept. 29	1,300
Flower City Rose Co. ..	Manchester	5	July 22	1,079
Fraser's Nurseries & Dahlia Gardens	Willimantic	3	Aug. 14	1,148
Galligan, Clarence W. ..	New Haven	1	Oct. 9	1,322
Gallup, Amos M.	Pawcatuck	1	Aug. 28	1,179
Gardner's Nurseries	Rocky Hill 125		Aug. 18	1,154
Geduldig's Nurseries	Norwich	6	Sept. 30	1,306
Gilbert, Henry G.	Danielson	2	Sept. 23	1,268
Glastonbury Gardens ...	Glastonbury	2	July 22	1,091
Glen Terrace Nurseries..	Hamden	35	Aug. 2	1,120
Godfrey's Stratfield Nurseries	Bridgeport	40	Sept. 30	1,304
Golden Hill Nursery ...	Shelton	2	Oct. 14	1,334
Goodwin Nurseries	Bloomfield	7	Aug. 18	1,153
Grillo, Nicholas	Milldale	1	Aug. 9	1,131
Griswold, George (2) ...	Old Lyme	1	Aug. 19	1,156
Haas, Emil	Devon	1	Oct. 21	1,347
Hall, Henry A. L.	West Haven	1	Sept. 16	1,242
Hamden Nursery	Hamden	1	Oct. 14	1,335

[1] Home address, 19 Warner St., Springfield, Mass.

Name of firm	Address	Acreage	Certificate issued	Number certificate
Hanford, R. G.	Norwalk	4	Sept. 3	1,203
Hansen, Peter	Fairfield	5	Sept. 3	1,202
Harrington, Walter P.	North Granby	15	Oct. 20	1,346
Hawes, F. M.	West Hartford	1	Sept. 4	1,206
Hearn, Thomas H.	Washington	3	Sept. 10	1,225
Heath & Company	Manchester	5	July 22	1,076
Hendrix, Mrs. Edwin A.	New Milford	1	Sept. 25	1,282
Henninger, Christ.	New Britain	1	Sept. 22	1,264
Hillcrest Gardens	Woodbridge	2	Aug. 26	1,163
Hilliard, H. J.	Sound View	1	Aug. 14	1,145
Hinckley Hill Nurseries	Stonington	1	Aug. 28	1,180
Hiti Nurseries	Pomfret Center	10	Aug. 2	1,119
Holcomb, H. Parks	Winsted	2	Oct. 6	1,315
Holcomb, Irving	Simsbury	1	July 29	1,113
Holdridge & Son, S. E.	Norwich	4	Aug. 28	1,184
Hopeville Gardens	Waterbury	2	Aug. 9	1,132
Horan, James F.	Hartford	2	Oct. 16	1,340
Horan & Son, James	Bridgeport	1	Sept. 20	1,262
Houston's Nurseries	Mansfield	15	Sept. 18	1,245
Hoyt, Charles E.	Danbury	4	Sept. 5	1,209
Hoyt's Sons Co., Inc., Stephen	New Canaan	300	Aug. 4	1,125
Hunt & Co., W. W.	Hartford	8	Aug. 26	1,170
Innes, William	Milford	2	Aug. 4	1,126
Intravaia & Sons, J.	Middletown	1	July 23	1,101
Jennings, G. S.	Southport	2	Dec. 6	1,368
Johnson, Harry L.	South Meriden	1	Sept. 26	1,286
Johnson, Tom	Stratford	1	Sept. 23	1,274
Josifko, Frank (2)	Madison	5	Sept. 17	1,244
Judd, T. H.	Danbury	1	Dec. 18	1,371
Kast, Alfred A.	Yalesville	1	Sept. 6	1,213
Kelley's Marigold Farm Nursery	New Canaan	15	Aug. 23	1,160
Kelley & Son, James J.	New Canaan	5	Sept. 3	1,198
Keystone Nurseries	Danbury	1	Sept. 5	1,211
Langstroth Conifer Nursery	Danbury	6	Aug. 2	1,121
Leghorn, John J.	Cromwell	17	July 22	1,085
Lewis & Valentine, Inc.	Darien	9	Aug. 30	1,192
Lockwood, Percy A. (2)	Shelton	1	Sept. 29	1,296
Lundberg, E. A.	Darien	1	Sept. 26	1,285
Lynch, Mrs. John H.	Ridgefield	5	Sept. 24	1,278
Mallett, Geo. A.	Bridgeport	5	Sept. 6	1,215
Maplehurst Flower Gardens	Fairfield	1	Oct. 22	1,350
Maplewood Nursery Co.	Norwich	2	Oct. 29	1,356
Mason, Warren S.	Farmington	1	Sept. 24	1,280
Mather, S. T.	Darien	1	Aug. 25	1,162
Mayapple Nursery	Stamford	1	Oct. 29	1,357
McCarthy, John P.	Danbury	1	Sept. 23	1,269
McConville, John	Manchester	2	July 22	1,086
Meachen, Mrs. George C.	Stratford	1	Sept. 23	1,272
Meier, A. R.	West Hartford	1	Sept. 19	1,250

Name of firm	Address	Acreage	Certificate issued	Number certificate
Merwin Lane Nursery ..	East Norwalk	3	July 22	1,075
Meyer, Carl H. H.	Riverside	10	Aug. 7	1,129
Meyer, Ludwig	Bridgeport	4	Oct. 17	1,342
Middeleer, Inc.	Darien	25	Aug. 19	1,155
Millane Nurseries & Tree Experts Co., Inc.	Cromwell	30	Aug. 26	1,167
Mill River Nursery	Fairfield	8	Sept. 13	1,230
Millstone Garden	Terryville	1	Sept. 26	1,287
Milton Flower Farm ...	Milton	1	Sept. 4	1,207
Minge, G. H.	Rocky Hill	1	Aug. 22	1,157
Montgomery Evergreen Nursery, Inc.	Cos Cob	2	Oct. 22	1,351
Moraio Brothers	Stamford	5	Sept. 12	1,229
Morgan, Wm. F.	North Stonington ..	2	Aug. 28	1,183
Mountain Farm Nursery (2)	West Hartford	2	Sept. 30	1,305
Mount Airy Gardens ...	Stamford	1	Sept. 16	1,236
Mount Carmel Nursery..	Mount Carmel	1	Aug. 26	1,169
New Britain Board of Water Commissioners..	New Britain	50	Sept. 29	1,298
Newell Nurseries, The ..	Hartford	3	Aug. 11	1,136
New Haven Park Commission	New Haven	10	Oct. 17	1,344
Newington Gardens & Nurseries	Newington Junction	1	Aug. 28	1,176
New London Cemetery Association	New London	1	Oct. 14	1,332
New London County Nurseries	New London	5	Sept. 15	1,235
New York, New Haven & Hartford Railroad Co. (C. A. Haggerty)	Stamford	6	Oct. 4	1,312
Nicolson & Thurston ...	Litchfield	1	Aug. 2	1,124
North-Eastern Forestry Co.	Cheshire	60	July 23	1,097
Norwood Nursery	Hamden	1	July 29	1,114
Oakland Nurseries, The..	Manchester	5	July 22	1,077
Oakwood Novelty Gardens	East Hartford	1	July 22	1,080
Ostergren, Herbert	Cromwell	2	July 22	1,084
Outpost Farm & Nursery Corp.	Ridgefield 150		Aug. 25	1,161
Ouwerkerk, D. K.	Yalesville	10	July 29	1,111
Ox Yoke Farm Nurseries (2)	Bridgeport	2	Sept. 29	1,293
Panella, P.	Elmwood	1	May 27	1,071
Park Gardens	Bridgeport	1	Sept. 30	1,303
Park Place Nurseries ...	Marion	2	Aug. 28	1,175
Paton, William D.	Mount Carmel	2	Oct. 8	1,317
Patrick, Charles	Bridgeport	2	Oct. 15	1,337
Patterson, John	Old Saybrook	2	Sept. 5	1,208
Pedersen, Anthon	Stamford	3	Oct. 11	1,328
Pedone & Co., Ludovico	Goshen	5	Sept. 10	1,220
Peschko, Robert	Danbury	1	Sept. 5	1,210

Name of firm	Address	Acreage	Certificate issued	Number certificate
Pestretto, Frank	West Hartford	1	Oct. 9	1,324
Pestretto, Salvatore	Hartford	1	Aug. 27	1,171
Pflomm, Chas. W.	Bridgeport	1	Oct. 11	1,330
Phelps & V. T. Hammer Co., J. W.	Branford	3	Sept. 29	1,290
Pierrepont, Seth L. (2)	Ridgefield	10	Aug. 30	1,189
Pierson, Inc., A. N.	Cromwell	200	July 29	1,110
Pinatello, Michael	East Hartford	3	Sept. 13	1,233
Pinchbeck Bros., Inc. ...	Ridgefield	15	Sept. 13	1,248
Pine Plains Greenhouse, Inc.	Norwich	1	Oct. 1	1,308
Polish Orphanage Farm	New Britain	1	Sept. 30	1,302
Pomeroy Blue Spruce Gardens	New Milford	5	Sept. 11	1,222
Powers, R. J.	Noroton	1	Nov. 12	1,364
Pratt, Jr., George D. ...	Bridgewater	1	Oct. 15	1,338
Prospect Nurseries, Inc.	Cromwell	25	July 25	1,109
Prudence Seymour Gardens	New Milford	1	Sept. 11	1,223
Rabinak, Louis	Deep River	2	Aug. 14	1,141
Race Brook Gardens, Inc.	Orange	1	Oct. 20	1,345
Rengerman, A. B.	Granby	1	Sept. 12	1,228
Reynolds' Farm	South Norwalk	1	Aug. 1	1,118
Richmond, Gordon L. ..	New Milford	8	Aug. 2	1,123
Robinson, Burr A.	North Haven	1	May 1	1,069
Rockfall Nursery Co. ...	Rockfall	110	Sept. 13	1,232
Rose Hill Nursery	Gildersleeve	1	Aug. 11	1,134
Rosery Rest, The	Bridgeport	5	Dec. 1	1,367
Russell, Charles B.	Newington	1	Aug. 13	1,138
Sachem Forest Landscape Service	New Haven	1	Sept. 19	1,256
Sage, Hollister	North Woodbury ...	1	Sept. 11	1,224
Sandelli's Greenhouse ...	New Britain	1	Oct. 30	1,358
Sasco Hill Evergreen Nursery	Southport	1	July 22	1,094
Saxe and Floto	Waterbury	1	Aug. 28	1,174
Scarano, Alphonso	Groton	1	Aug. 28	1,187
Schaeffer Bros.	Norwich	3	Sept. 15	1,234
Schneider, Godfrey	West Haven	1	Sept. 25	1,283
Schulze, Charles T.	Bethel	3	Sept. 29	1,301
Scott's Nurseries	Bloomfield	10	Sept. 11	1,227
Seltsam's Pequonnock Gardens	Bridgeport	1	Sept. 16	1,238
Seymour's Hemlock Nursery	Riverton	2	Sept. 19	1,252
Sharon Valley Nursery (2)	Sharon	1	Sept. 19	1,253
Sierman, C. H.	Hartford	8	Aug. 16	1,149
Silver City Nursery	Meriden	1	Aug. 27	1,172
Silver Lane Nursery Co.	Burnside	1	Aug. 11	1,135
Silvermine Nurseries ...	Norwalk	1	July 30	1,115
Simonsen, H. C.	Plainville	3	Oct. 1	1,309
Snelgrove, S. J.	Windsor	1	July 22	1,083
Soltes Nursery, M. J. ...	Shelton	1	Sept. 26	1,284
Southport Nursery	Southport	26	Aug. 14	1,147

Name of firm	Address	Acreage	Certificate issued	Number certificate
South Wilton Nurseries..	Wilton	3	July 22	1,093
Spencer, W. L. L.	Columbia	1	July 25	1,106
Spring Nurseries	Bristol	3	Oct. 14	1,331
Stack, Garrett M.	Guilford	1	Aug. 30	1,195
Stack, Thomas M.	New Milford	1	Sept. 11	1,226
Stafford Conservatories..	Stafford Springs ...	1	July 22	1,087
Stannard, E. H.	Wilton	15	Sept. 10	1,219
State Highway Department (Landscape Division)	Hartford	9	Sept. 10	1,221
State of Conn. Forest Nursery (A. F. Hawes, Forester)	Hartford	4	Oct. 11	1,329
State Street Nursery ...	New Haven	3	Aug. 18	1,152
Steck, Jr., C. A.	Bethel	5	Sept. 22	1,267
Steck, Charles A.	Newtown	10	Nov. 1	1,359
Steck Nurseries, Inc. ...	Farmington	10	Nov. 19	1,365
Steck, Sarah B.	Bethel	1	Sept. 9	1,218
Stratford Rose Nurseries	Stratford	3	Sept. 23	1,271
Sunridge Nursery	Greenwich	50	Aug. 6	1,128
Thomas & Sons, Inc., W. D.	Hamden	2	Sept. 16	1,243
Torrizzo, P. A.	West Hartford	1	Aug. 26	1,168
Tracy, B. Hammond ...	Yalesville	1	Sept. 6	1,214
Tryon, George W.	North Stonington ..	1	Aug. 28	1,181
Van der Bom, F.	Bethel	3	Aug. 26	1,165
Vanderbrook & Son, C. L.	Manchester	35	July 22	1,092
Vanderstam, C. L.	Yalesville	2	July 23	1,099
Van Wilgen Nurseries ..	Branford	12	Oct. 3	1,310
Vasileff, Nicholas	Greenwich	4	Sept. 3	1,200
Verkade's Nurseries	New London	50	Sept. 19	1,251
Vernick Nurseries	Bridgeport	2	Oct. 22	1,348
Wallace Nursery	Wallingford	9	Sept. 6	1,212
Ward & Son, John F. (2)	Windsor	1	July 22	1,082
Water Bureau, Metropolitan District Commission of Hartford County	Hartford	50	Oct. 24	1,353
Watrous, Arthur J.	Meriden	1	Oct. 8	1,318
Westville Nurseries	New Haven	2	Dec. 12	1,369
Wheeler, C. B.	Stonington	1	Aug. 28	1,188
Whittemore Co., J. H. ..	Naugatuck	3	Oct. 25	1,355
Wilcox, Elmer E.	Guilford	1	Aug. 30	1,194
Wild's Nursery, Henry..	Greenwich and Norwalk	30	Sept. 3	1,199
Willett, William	Pawcatuck	1	Aug. 30	1,191
Williams, Harry G.	Shelton	1	Sept. 29	1,297
Wilmacco Gardens	Manchester	5	Sept. 19	1,257
Wilridge Nurseries	Ridgefield	3	Sept. 20	1,263
Wilson & Co., Inc., C. E.	Manchester 110		July 31	1,116
Wilson's Tree Farms, Inc.	Cromwell	10	Aug. 7	1,130
Woodbridge Nursery Co.	New Haven	4	Nov. 8	1,361
Woodruff, C. V.	Orange	1	Oct. 9	1,323
Wood Street Nursery ...	West Haven	1	Sept. 22	1,266
Wyllie, David	Whitneyville	1	Nov. 10	1,362

Name of firm	Address	Acreage	Certificate issued	Number certificate
Yale Forest School Nursery	New Haven	1	Sept. 3	1,197
Yale University, Landscape Department	New Haven	5	Oct. 4	1,314
Zack Co., H. J.	Deep River	8	Aug. 14	1,143
		3,655		

Duplicate Certificates to Be Filed in Other States

Many states require that out-of-state nurserymen file certificates of inspection of their nurseries before allowing nursery stock to be shipped into these states. This office is willing to furnish duplicate certificates for this purpose, and during 1930, 220 such duplicates have been issued.

Inspection of Raspberry Plantations

During 1930, no applications were received for the special inspection and certification of raspberry plants on account of mosaic and allied diseases in order to meet the requirements of Michigan, Minnesota, New York, Vermont and Wisconsin. Consequently, no such inspections were made and no certificates issued.

Registration of Nursery Dealers

Section 2137, General Statutes (revision of 1930), provides that dealers in nursery stock must register each year, on or before March 1, with the State Entomologist, and cite the principal sources of their nursery stock. All dealers' permits are for the remainder of the calendar year and expire on December 31. During the year 120 such dealers have registered and received permits. The list of dealers is on file in the office of the State Entomologist, but is not printed in this Report.

Registration of Out-of-State Nurserymen

Nurserymen in other states who wish to ship stock into Connecticut are required to file with the State Entomologist signed copies of their nursery inspection certificates and make application for permits to ship stock into the state. These permits are valid only for the periods covered by the certificates placed on file. During the year 258 permits were issued to nurserymen in other states, but the list of firms receiving them is not printed in this Report.

Parcel Certificates

In addition to the regular inspection and certification of nursery stock, occasionally individuals wish to send shrubs and plants to their friends, and sometimes nurserymen need to ship packages before receiving their regular certificates. Consequently, 307 separate parcels of nursery stock were inspected and package certificates furnished.

Inspection of Narcissus Bulbs

On account of Federal Quarantine No. 62, narcissus bulbs grown in Connecticut cannot be shipped into other states unless given two inspections, one in the field in May, and the other after the bulbs have been dug for shipment. In case they are found to be infested with bulb flies or eelworms, they must then be treated. During the year 22,000 such bulbs were inspected and certified.

Inspection of Laurel and Decorative Materials

Considerable decorative material is gathered each year in Connecticut woodlands and shipped into New York City. This is mostly mountain laurel, *Kalmia latifolia.* If gathered within the gipsy moth quarantined area, it is examined by Federal inspectors, and if found clean, is certified for shipment. Much of it is collected outside the quarantined area and yet cannot enter New York without being certified. During the year nine such certificates were issued.

Inspection of Shelled Seed Corn

On account of the European corn borer having been found in a portion of Connecticut, certain states would not allow shelled sweet corn for seed to enter unless it had been inspected and certified to be free from bits of cob large enough to carry borers. Therefore a large quantity of such seed corn was inspected as it came through the cleaning mill, and 938 certificate tags were issued covering shelled corn and certain other seeds.

Blister Rust Control Area Permits

In 1929, nine blister rust control areas were legally established in Connecticut. Under such conditions, the Federal regulations require that before any shipments of currants, gooseberries or other species of *Ribes* or white pine or other five-leaf pines are shipped into the state, the shipper must apply to the State Entomologist for a permit. The shipper must give name and address of both consignor and consignee, and the name and number of

plants of each species and variety to be shipped. If the shipment is to be sent to a point outside the control areas and does not contain any prohibited plants, the permit is granted. During the year 243 such permits have been issued. Black currants are now debarred by statute. The text of the law follows:

Section 2127 (General Statutes, revision of 1930). European black currant plants. Any person who shall grow, plant, propagate, cultivate, sell, transport or possess any plant, root or cutting of the European black currant, or *Ribes nigrum,* shall be fined not less than five dollars nor more than twenty-five dollars. The director of the Connecticut Agricultural Experiment Station is authorized to seize and destroy any plants, roots or cuttings of said European black currant found in the State.

INSPECTION OF IMPORTED NURSERY STOCK

W. E. Britton and M. P. Zappe

The only nursery stock allowed to enter Connecticut direct from foreign countries, since 1920, has been rose stocks and fruit-tree seedlings for propagation. Of course this material enters the United States under specifications of the Federal Plant Quarantine and Control Administration, and is released at ports of entry to be inspected at points of destination by state inspectors. Other plant material brought into the country must go to Washington, where it is examined, and where it may be detained, fumigated or destroyed in case of infestation. Strict and thorough precautions are taken by the Plant Quarantine and Control Administration before allowing the plants to be distributed. Probably there will be smaller quantities of stock to inspect in the future as only certain kinds of fruit stocks can now be imported.

The imported nursery stock entering Connecticut in 1929-1930 was inspected by Mr. Zappe and Mr. McFarland. There were fewer shipments, cases, and number of plants than last year as the following table shows:

Year	Number shipments	Number cases	Number plants
1920	17	87	814,491
1921	21	126	1,228,560
1922	30	159	1,997,595
1923	35	179	1,981,895
1924	33	313	3,489,170
1925	27	277	2,977,346
1926	32	347	3,443,357
1927	31	321	3,229,915
1928	26	277	2,680,700
1929	23	225	2,022,475
1930	20	213	1,851,300

Sources of Imported Nursery Stock

The greatest number of shipments and cases came from Holland, but the greatest number of plants came from France. The following table shows the sources of this stock:

Country	Number shipments	Number cases	Number plants
Holland	12	130	834,200
France	5	80	1,002,100
England	2	2	10,000
Ireland	1	1	5,000
Total	20	213	1,851,300

These 20 shipments were imported by six different Connecticut firms, two of which imported 184 of the 213 cases, containing 1,701,300 plants. Of the whole number of shipments, 15 contained only rose stocks, two were only fruit stocks, and three contained both rose and fruit stocks.

Of this plant material inspected, 906,100 plants or about 49 per cent were rose stocks, and the remainder or about 51 per cent were fruit seedlings, the quantity of each different variety being shown in the following table:

KINDS OF STOCK IMPORTED

Rose stocks		
Rosa manetti	844,100	
Rosa rugosa	50,000	
Rosa multiflora	12,000	
		906,100
Fruit stocks		
Apple (all kinds)	252,800	
Cherry (all kinds)	560,700	
Pear	75,000	
Plum	51,300	
Quince	5,400	
		945,200
Total		1,851,300

Time of Arrival and Inspection

This imported nursery stock usually begins to arrive in the late fall and continues into the winter. Some importers desire an immediate inspection, but others place the stock in storage and request that a little be inspected each week as they desire to use it in grafting and propagating. The following table shows the quantities of stock as inspected each month:

Month	Number shipments	Number cases	Number plants
December	5	18	122,500
January	7	83	905,500
February	6	105	773,300
March	1	3	30,000
April	1	4	20,000
Total	20	213	1,851,300

The time required to inspect this stock is equivalent to one man working 20 days, and this time, together with traveling and other necessary expenses, amounts to nearly $400.

In addition to the material enumerated and tabulated above, there were nine shipments of new varieties of plants, and 33 shipments containing 2,140 pounds of tree seeds that were not inspected in Connecticut because the plants were inspected and the seeds fumigated with carbon disulfide at Washington, D. C. The plants included 582 perennials and 200 orchids from England, 200 irises from Holland, 250 gladioli from New Zealand, 15 dahlias and 25 gladioli (two shipments each) from Holland, and two cases of rock plants from Canada.

Of the tree seeds, there were 31 shipments, containing 1,420 pounds from Japan, one shipment containing 717 pounds from Austria, and one shipment of three pounds from China, or a total of 2,140 pounds.

Reports of the 20 shipments of plants inspected were sent to the Plant Quarantine and Control Administration, Washington, D. C.

Results of Inspection

Of the 20 shipments inspected, nine shipments, or 45 per cent, were found free from infestation, but in the other 11 shipments, or 55 per cent, there were insects, small animals or plant diseases, some of which are well-known pests. Details of these infestations are given below:

INFESTATIONS INTERCEPTED ON IMPORTED NURSERY STOCK

11 Shipments Infested

	Insects
Acronycta rumicis Linn.	On pear (2 shipments) A. Fermaud, Angers, France
	On cherry, Andre Choplin, Maze, France
Aporia crataegi Linn.	On pear, A. Fermaud, Angers, France
Calophasia lunula Hubn.	On pear and cherry (2 shipments) A. Fermaud, Angers, France
Elaterid beetle (dead)	Felix & Dykhius, Boskoop, Holland

Insects—*Cont.*

Emphytus cinctus Linn.	On rose (2 shipments) Association Flora, Boskoop, Holland; (2 shipments) J. Blaauw, Boskoop, Holland; (2 shipments) Felix & Dykhius, Boskoop, Holland; A. Fermaud, Angers, France; Otto & Sons, Boskoop, Holland
Eurydemus festivus Linn.	In packing material, A. Fermaud, Angers, France
Hymenopterous cocoons	A. Fermaud, Angers, France
Apanteles glomeratus Linn.	A. Fermaud, Angers, France
Gambrus inferus	A. Fermaud, Angers, France
Papilio podalirius Linn.	On cherry, Andre Choplin, Maze, France
Pieris brassicae Linn.	On plum, A. Fermaud, Angers, France

Plant Diseases

Crown gall on rose	(2 shipments) Association Flora, Boskoop, Holland

INSPECTION OF APIARIES IN 1930

W. E. Britton

In 1930, as in preceding years, apiaries in Connecticut were inspected by Mr. H. W. Coley, of Westport, and Mr. A. W. Yates, of Hartford, both experienced beekeepers and inspectors who do this work on a *per diem* basis. The territory is about equally divided: Mr. Coley inspects the apiaries in the four southern counties of the State, namely, Fairfield, New Haven, Middlesex and New London, and Mr. Yates the four northern counties of Litchfield, Hartford, Tolland and Windham.

For several years the appropriation for apiary inspection has been $4,000 for the biennial period. This amount is inadequate to cover the cost of inspecting all known apiaries each year, so certain towns are visited in alternate seasons. An attempt has been made, however, to cover all towns in each two-year period.

This inspection work in 1930 required 162 man days, and together with traveling expenses, cost $2,132.05. In all, 1,059 apiaries containing 10,335 colonies were inspected in 1930, as against 990 apiaries containing 9,559 colonies inspected in 1929. The apiaries averaged 9.76 colonies each in 1930 and 9.55 each in 1929.

The following table shows the number of apiaries and colonies inspected, the average number of colonies per apiary, and the average cost of inspecting each apiary and colony for each year since the inspection work started in 1910:

TWENTY-ONE-YEAR RECORD OF APIARY INSPECTION IN CONNECTICUT

Year	Number apiaries	Number colonies	Average No. colonies per apiary	Average cost of inpection per apiary	per colony
1910	208	1,595	7.6	$2.40	.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10.1	2.37	.234
1928	852	8,023	9.41	2.12	.225
1929	990	9,559	9.55	2.19	.227
1930	1,059	10,335	9.76	2.01	.206

In 1930, apiaries were inspected in 154 towns as against 141 towns in 1929, and 149 towns in 1928. Inspections were made in 1930 in the following 24 towns not visited in 1929:

Fairfield County—Monroe, New Fairfield, Newtown, Shelton, Sherman, Trumbull, Westport and Weston; Litchfield County—Bridgewater, New Milford and Roxbury; Middlesex County—Saybrook; New Haven County—Ansonia, Bethany, Milford, Orange, Southbury, Waterbury and Woodbridge; New London County—Preston and Sprague; Tolland County—Tolland and Willington.

On the other hand, in the following 12 towns visited in 1929, no inspections were made in 1930:

Fairfield County—Brookfield; Hartford County—Marlborough; Middlesex County—Westbrook; New Haven County—Beacon Falls, Derby, Seymour and West Haven; New London County—Ledyard; Tolland County—Bolton, Columbia, Hebron and Union.

In the following three towns no inspections were made in either 1929 or 1930:

Fairfield County—Bridgeport; New Haven County—Oxford; New London County—Bozrah.

European Foul Brood

European foul brood is caused by a bacterial germ known as *Bacillus pluton,* which kills the young larvae or brood in the comb. The cell contents, though not gelatinous, ropy or particularly offensive, often have the odor of fermentation. This disease was very prevalent in Connecticut apiaries 20 years ago but has gradually subsided. It usually appears in early summer, and the treatment practiced is to requeen with Italian queens, and to unite two or more weak colonies to make them strong.

Of the 1,059 apiaries and 10,335 colonies inspected in 1930, only three apiaries and three colonies were found infested with European foul brood. This is equivalent to .028 per cent of the apiaries and .0029 per cent of the colonies inspected for the season and is about the same as the percentages for 1929.

The following table shows a complete record of percentages of European foul brood in Connecticut since the inspections were started in 1910:

RECORD OF EUROPEAN FOUL BROOD

Year	Percentage of infestation		Year	Percentage of infestation	
	Apiaries	Colonies		Apiaries	Colonies
1910	75.9	49.7	1921	3.91	1.26
1911	51.8	27.4	1922	4.14	.85
1912	47.7	23.5	1923	2.34	.36
1913	44.4	24.5	1924	1.78	.526
1914	32.6	13.9	1925	2.48	.507
1915	26.1	10.3	1926	3.19	858
1916	18.8	7.05	1927	1.12	.282
1917	16.7	4.86	1928	1.05	.324
1918	9.8	3.3	1929	.02	.003
1919	6.6	1.2	1930	.028	.0029
1920	4.3	1.5			

During the season of 1930, European foul brood was discovered in two towns only: Plymouth, in Litchfield County, and Plainfield, in Windham County. No apiaries infested with this disease were found in Fairfield, Hartford, Middlesex, New Haven, New London and Tolland Counties.

American Foul Brood

American foul brood is also caused by a bacterial germ or organism known to science as *Bacillus larvae.* It infects and kills the brood or larvae in their cells at a time when nearly mature. The symptoms are evident after the cells have been sealed and often after the brood has pupated. The cells are shrunken, and

the contents have a peculiar ropy or stringy consistency with very offensive odor. The usual treatment is to shake the bees into clean hives, destroy or disinfect the old hives, and destroy the infected combs. It is possible to disinfect the combs by soaking them in an alcohol-formalin solution containing 20 per cent of formalin though this treatment is not generally or widely practiced or recommended.

Of the 1,059 apiaries and 10,335 colonies inspected in 1930, 53 apiaries and 107 colonies were found infested with American foul brood. This is equivalent to 5.004 per cent of the apiaries and 1.03 per cent of the colonies inspected in 1930. This record exceeds slightly that of 1929 in regard to the percentage of apiaries infested, but is a slightly lower percentage of the number of colonies.

The following table shows a complete record of American foul brood in Connecticut since the apiary inspection work was started in 1910:

RECORD OF AMERICAN FOUL BROOD

Year	Percentage of infestation		Year	Percentage of infestation	
	Apiaries	Colonies		Apiaries	Colonies
1910	0	0	1921	2.5	.56
1911	0	0	1922	1.38	.27
1912	0	0	1923	.985	.323
1913	0	0	1924	1.04	.22
1914	1.07	.7	1925	3.26	.424
1915	.8	.18	1926	1.72	.29
1916	1.07	.15	1927	3.11	.70
1917	.42	.17	1928	4.213	.98
1918	1.01	.32	1929	4.64	1.2
1919	3.	1.1	1930	5.004	1.03
1920	1.18	.25			

In 1930, American foul brood was discovered in the following 36 towns: Fairfield County—Danbury, Redding, Ridgefield, Sherman and Wilton; Hartford County—Bloomfield, Bristol, Hartland, New Britain, Plainville and West Hartford; Litchfield County—Bethlehem, Litchfield, Morris, Plymouth, Watertown, Winchester and Woodbury; Middlesex County—Clinton, Durham, East Hampton, Killingworth and Middlefield; New Haven County—Cheshire, North Haven, Orange and Wallingford; New London County—East Lyme, Norwich, Old Lyme, Salem and Stonington; Tolland County—Coventry, Ellington, Mansfield and Vernon; Windham County—Killingly.

Sacbrood

Sacbrood, or pickled brood, is thought to be caused by a filterable virus and not a definite parasitic organism. The diseased brood or larvae die at about the time the cells are capped. The body is swollen and lies on its back with head turned upward. The cell contents are watery but there is no ropiness, and all may be removed intact as if enclosed in a sac. The color varies but is often light yellowish brown with head nearly black.

The usual treatment is to unite the weak colonies to make them stronger. In certain cases where the entire apiary becomes affected, each colony should be requeened.

The following table shows the record of sacbrood in Connecticut since the inspection work began in 1910:

RECORD OF SACBROOD

Year	Percentage of infestation		Year	Percentage of infestation	
	Apiaries	Colonies		Apiaries	Colonies
1910	0	0	1921	1.06	.157
1911	....	.51	1922	1.37	.187
1912	....	Several	1923	.53	.086
1913	....	2.8	1924	1.78	.52
1914	2.59	.721	1925	3.39	.836
1915	2.02	.47	1926	1.1	.138
1916	.428	.051	1927	.03	.0036
1917	1.48	.199	1928	.035	.087
1918	.253	.032	1929	.001	.0006
1919	1.24	.19	1930	0	0
1920	1.18	.229			

In 1930, no sacbrood was found in Connecticut.

Statistics of Inspection

The statistics of apiary inspection by towns and counties are given on the following pages, with summary on pages 498 and 499:

INSPECTION OF APIARIES, 1930

Town	Apiaries		Colonies		Foul brood	
	Inspected	Diseased	Inspected	Diseased	American	European
Fairfield County						
Bethel	7	0	57	0	0	0
Bridgeport	0	0	0	0	0	0
Brookfield	0	0	0	0	0	0
Danbury	12	1	180	2	2	0
Darien	4	0	83	0	0	0
Easton[1]	2	0	86	0	0	0

[1] One apiary inspected twice.

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European
Fairfield County—*Cont.*						
Fairfield	6	0	60	0	0	0
Greenwich	20	0	179	0	0	0
Monroe	5	0	121	0	0	0
New Canaan	10	0	77	0	0	0
New Fairfield	6	0	35	0	0	0
Newtown	5	0	112	0	0	0
Norwalk	2	0	39	0	0	0
Redding	3	1	42	4	4	0
Ridgefield	7	1	36	2	2	0
Shelton	1	0	12	0	0	0
Sherman	4	1	63	2	2	0
Stamford	13	0	174	0	0	0
Stratford	2	0	4	0	0	0
Trumbull	2	0	13	0	0	0
Weston	1	0	18	0	0	0
Westport	2	0	23	0	0	0
Wilton	11	2	198	3	3	0
	130	6	1,612	13	13	0
New Haven County						
Ansonia	4	0	30	0	0	0
Beacon Falls	0	0	0	0	0	0
Bethany	1	0	2	0	0	0
Branford	1	0	11	0	0	0
Cheshire	10	1	71	1	1	0
Derby	0	0	0	0	0	0
East Haven	2	0	10	0	0	0
Guilford	6	0	36	0	0	0
Hamden	10	0	63	0	0	0
Madison	2	0	10	0	0	0
Meriden	11	0	187	0	0	0
Middlebury	6	0	81	0	0	0
Milford	1	0	16	0	0	0
Naugatuck	5	0	57	0	0	0
New Haven	1	0	6	0	0	0
North Branford	1	0	34	0	0	0
North Haven	3	1	47	2	2	0
Orange	11	1	103	1	1	0
Oxford	0	0	0	0	0	0
Prospect	3	0	42	0	0	0
Seymour	0	0	0	0	0	0
Southbury	3	0	27	0	0	0
Wallingford[1]	6	2	136	4	4	0
Waterbury	4	0	35	0	0	0
West Haven	0	0	0	0	0	0
Wolcott	5	0	23	0	0	0
Woodbridge	4	0	44	0	0	0
	100	5	1,071	8	8	0

[1] Two apiaries inspected twice.

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European
Middlesex County						
Chester	6	0	38	0	0	0
Clinton	4	2	42	13	13	0
Cromwell	5	0	69	0	0	0
Durham	5	1	185	2	2	0
East Haddam	12	0	305	0	0	0
East Hampton	9	1	136	2	2	0
Essex	5	0	32	0	0	0
Haddam	4	0	79	0	0	0
Killingworth	5	1	17	3	3	0
Middlefield	4	1	90	2	2	0
Middletown	5	0	88	0	0	0
Old Saybrook	4	0	60	0	0	0
Portland	9	0	96	0	0	0
Saybrook	2	0	13	0	0	0
Westbrook	0	0	0	0	0	0
	79	6	1,250	22	22	0
New London County						
Bozrah	0	0	0	0	0	0
Colchester	9	0	126	0	0	0
East Lyme	2	1	56	2	2	0
Franklin	2	0	99	0	0	0
Griswold	4	0	80	0	0	0
Groton	2	0	37	0	0	0
Lebanon	10	0	229	0	0	0
Ledyard	0	0	0	0	0	0
Lisbon	1	0	28	0	0	0
Lyme	2	0	59	0	0	0
Montville	8	0	118	0	0	0
New London	1	0	10	0	0	0
North Stonington	1	0	25	0	0	0
Norwich	7	2	376	3	3	0
Old Lyme	3	1	116	2	2	0
Preston	2	0	59	0	0	0
Salem	4	1	46	3	3	0
Sprague	1	0	20	0	0	0
Stonington	3	1	27	2	2	0
Voluntown	1	0	12	0	0	0
Waterford	3	0	44	0	0	0
	66	6	1,567	12	12	0
Litchfield County						
Barkhamsted	2	0	3	0	0	0
Bethlehem	13	3	88	4	4	0
Bridgewater	4	0	106	0	0	0
Canaan	3	0	20	0	0	0
Colebrook	4	0	33	0	0	0
Cornwall	7	0	36	0	0	0
Goshen	7	0	50	0	0	0
Harwinton	5	0	18	0	0	0
Kent	4	0	108	0	0	0
Litchfield	14	2	133	2	2	0
Morris	7	2	41	5	5	0
New Hartford	9	0	38	0	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European
Litchfield County—*Cont.*						
New Milford	6	0	117	0	0	0
Norfolk	5	0	17	0	0	0
North Canaan	5	0	90	0	0	0
Plymouth	13	2	57	2	1	1
Roxbury	2	0	12	0	0	0
Salisbury	7	0	84	0	0	0
Sharon	7	0	170	0	0	0
Thomaston	12	0	44	0	0	0
Torrington	15	0	77	0	0	0
Warren	2	0	7	0	0	0
Washington	8	0	108	0	0	0
Watertown	17	2	119	2	2	0
Winchester	17	3	72	3	3	0
Woodbury	4	1	78	2	2	0
	199	15	1,726	20	19	1
Hartford County						
Avon	10	0	58	0	0	0
Berlin	12	0	157	0	0	0
Bloomfield	14	2	195	3	3	0
Bristol	18	1	88	3	3	0
Burlington	10	0	48	0	0	0
Canton	9	0	49	0	0	0
East Granby	5	0	20	0	0	0
East Hartford	7	0	32	0	0	0
East Windsor	13	0	73	0	0	0
Enfield	7	0	51	0	0	0
Farmington	18	0	111	0	0	0
Glastonbury	17	0	105	0	0	0
Granby	7	0	87	0	0	0
Hartford	4	0	27	0	0	0
Hartland[1]	3	2	63	4	4	0
Manchester	15	0	86	0	0	0
Marlborough	0	0	0	0	0	0
New Britain[2]	14	2	98	12	11	0
Newington	9	0	70	0	0	0
Plainville	13	1	53	1	1	0
Rocky Hill	2	0	28	0	0	0
Simsbury	8	0	40	0	0	0
Southington	15	0	93	0	0	0
South Windsor	11	0	40	0	0	0
Suffield	10	0	79	0	0	0
West Hartford	9	2	82	3	3	0
Wethersfield	12	0	56	0	0	0
Windsor	6	0	76	0	0	0
Windsor Locks	2	0	3	0	0	0
	280	10	1,968	26	25	0

[1] One apiary inspected twice.
[2] One bee paralysis.

Town	Inspected Apiaries	Diseased Apiaries	Inspected Colonies	Diseased Colonies	American Foul brood	European Foul brood
Tolland County						
Andover	4	0	4	0	0	0
Bolton	0	0	0	0	0	0
Columbia	0	0	0	0	0	0
Coventry	10	1	51	1	1	0
Ellington	13	2	56	2	2	0
Hebron	0	0	0	0	0	0
Mansfield	11	1	45	3	3	0
Somers	8	0	45	0	0	0
Stafford	8	0	41	0	0	0
Tolland	6	0	45	0	0	0
Union	0	0	0	0	0	0
Vernon	14	1	61	1	1	0
Willington	11	0	67	0	0	0
	85	5	415	7	7	0
Windham County						
Ashford	3	0	21	0	0	0
Brooklyn	7	0	121	0	0	0
Canterbury	3	0	13	0	0	0
Chaplin	1	0	9	0	0	0
Eastford	8	0	36	0	0	0
Hampton	11	0	46	0	0	0
Killingly	14	1	63	1	1	0
Plainfield	16	2	62	2	0	2
Pomfret	7	0	72	0	0	0
Putnam	4	0	19	0	0	0
Scotland	6	0	28	0	0	0
Sterling	6	0	20	0	0	0
Thompson	8	0	51	0	0	0
Windham[1]	10	1	56	1	0	0
Woodstock	16	0	109	0	0	0
	120	4	726	4	1	2

Summary

County	Number towns	Apiaries inspected	Apiaries diseased	Colonies inspected	Colonies diseased	Foul brood American	Foul brood European
Fairfield[2]	21	130	6	1,612	13	13	0
New Haven[3]	22	100	5	1,071	8	8	0
Middlesex	14	79	6	1,250	22	22	0
New London	19	66	6	1,567	12	12	0
Litchfield	26	199	15	1,726	20	19	1
Hartford[1 2]	28	280	11	1,968	26	25	0
Tolland	9	86	5	415	7	7	0
Windham[1]	15	120	5	726	4	1	2
	154	1,059	59	10,335	112	107	3

[1] One bee paralysis.
[2] One apiary inspected twice.
[3] Two apiaries inspected twice.

	Number apiaries	Number colonies
Inspected	1,059	10,335
Infested with European foul brood	3	3
Percentage infested	.028	.0029
Infested with American foul brood	53	107
Colonies treated		64
Colonies destroyed		43
Percentage infested	5.004	1.03
Infested with sacbrood	0	0
Infested with bee paralysis		2
Average number of colonies per apiary		9.76
Cost of inspection	$2,132.05	
Average cost per apiary	2.01	
Average cost per colony	.206	

Registration of Bees

The law requiring beekeepers to register with their town clerks was first enacted in 1919, as Chapter 174, Public Acts of 1919. In 1923 this law was amended to require the town clerks to report such registrations to the State Entomologist not later than February 1, the amended law being Chapter 129, Public Acts of 1923. The General Assembly of 1929 further amended this law as Chapter 50, Public Acts of 1929, by requiring town clerks to report to the State Entomologist on or before December 1, whether or not any bees were registered and if registrations had been made to send a list of names with the number of colonies.

In the General Statutes, revision of 1930, this law now stands as follows:

SEC. 2129. **Registration of honey bees.** Each person owning one or more hives of bees shall, annually, on or before the first day of October, make application to the town clerk of the town in which such bees are kept, for the registration of such bees, and such town clerk shall issue to such applicant a certificate of registration upon the payment of a recording fee of twenty-five cents, which certificate shall be in the form prescribed and upon blanks furnished by the state entomologist and shall be recorded in the office of such town clerk. A record of such registration and of the name and place of residence of the registrant and the definite location in the town where bees are kept by him shall be kept in a separate book in the office of the town clerk, which record shall be accessible to the public. Each town clerk shall, on or before December first, report to the state entomologist whether or not any such owners have been registered by him, and file with said state entomologist a complete list of such registrations. Any owner of bees who shall fail to register as required by the provisions of this section shall be fined not more than five dollars.

During 1930, 891 apiaries containing 7,076 colonies were registered with the town clerks and reported to the State Entomologist. Report from the town of Cornwall was not received during the period required by law but was received later. The bees registered and reported amount to more than three-fourths of the number of apiaries, and more than two-thirds of the number of colonies inspected during the season of 1930.

In 1930, no bees were registered in the following nine towns: Derby, Guilford and West Haven in New Haven County; East Granby and Windsor Locks in Hartford County; Westbrook in Middlesex County; Westport in Fairfield County; Warren in Litchfield County; Bozrah in New London County. There were no inspections in 1930 in 15 towns, four of which are mentioned above as having no registrations in 1930.

The number of apiaries and colonies in Connecticut has been the subject of much speculation. In 1930, 1,059 apiaries and 10,335 colonies were inspected in 154 towns, and 891 apiaries and 7,076 colonies were registered in 158 towns. After checking these figures carefully and deducting those counted twice, definite figures are obtained and shown in the following table:

	Apiaries	Colonies
Inspected	1,059	10,335
Registered but not inspected	481	2,616
Total	1,540	12,951

Transportation of Bees: Warning

Section 2130 of the General Statutes, revision of 1930, provides that "No person or transportation company shall receive for transportation any colony or package of bees, unless such colony or package shall be accompanied by a certificate of good health, furnished by a duly authorized inspector. No person or transportation company shall deliver any colony or package of bees brought from any other country, province, state or territory unless accompanied by a certificate of health furnished by a duly authorized inspector of such country, province, state or territory. Any person or transportation company receiving a shipment of bees from without the state, unaccompanied by such certificate, shall, before delivering such shipment to its consignee, notify the State Entomologist and hold such shipment until inspected by a duly authorized inspector." The penalty is a fine of not more than $50.

The increasing practice of purchasing package bees or renting colonies to be placed in orchards at blossom time for pollination purposes makes it extremely difficult to control a disease like American foul brood unless the law is observed and enforced.

Package bees and queen bees may be shipped by mail under the Postal Laws and Regulations. Section 476 regarding queen bees is as follows:

"Queen bees and their attendant bees, when accompanied with a copy of a certificate of the current year from a State or Government apiary inspector to the effect that the apiary from which said queen bees are shipped is free from disease, or by a copy of a statement by the bee keeper, made before a notary public or other officer having a seal, that the honey used in making the candy used in the queen mailing cage has been diluted and boiled in a closed vessel x x x."

Postal Bulletin of August 18, 1928, regarding package bees is as follows:

"Office of the Postmaster General, Washington,
August 16, 1928.

Order No. 8142.

"Paragraph 1b, section 466, Postal Laws and Regulations, is amended to read as follows:

'Honey bees in quantities may be sent in the mails under the same conditions as are prescribed for queen bees and their attendant bees when delivery can be made to the addressee within a period of five days. If the cages are wooden, the material of which they are constructed shall not be less than three-eighths of an inch thick and the saw cuts therein or space between slats shall not be over one-eighth of an inch wide; if wire screen is used for the sides of the cages there shall be two thicknesses of screen separated by slats at least three-eighths of an inch in thickness. Semi-liquid food consisting of sugar syrup inclosed in a tin can with small holes in the bottom of the can to permit of a proper leakage of the food supply may be placed in the cages. The food can shall be securely suspended in the cage with the top of the can wedged against the top of the cage. Cleats approximately one inch high shall be securely fastened on the bottom of the cages to prevent the escape therefrom of any syrup that the bees may fail to consume. Each cage shall be provided with a suitable handle and be marked on the top with the words, "THIS SIDE UP." Such parcels shall be transported outside of mail bags.'"

Financial Statement

RECEIPTS

Appropriation year ending June 30, 1930	$2,000.00

EXPENDITURES

Personal services	$ 912.00
Travel	1,072.05
Total	$1,984.05
Balance on hand July 1, 1930	15.95
Grand Total	$2,000.00

GIPSY MOTH CONTROL IN CONNECTICUT IN 1930

W. E. Britton and John T. Ashworth

The work of suppressing the gipsy moth has been continued in the same manner as in former years by the State Entomologist in coöperation with the United States Plant Quarantine and Control Administration. During the year, no extensive wind-spread has been discovered and no noticeable defoliation has occurred in Connecticut. In fact there have been no important or unusual developments other than the discovery of rather large colonies in Branford, on the east side of Beseck Mountain in Middlefield, and on the top of West Peak in Meriden. Though these colonies were

rather difficult to handle because of their situation and environment, they were scouted thoroughly and all egg-clusters found were creosoted. During the caterpillar season, these infestations were sprayed heavily and recent scouting indicates that the work was successful. Further accounts of these infestations are given under "Details of Work by Towns."

As the Federal men are particularly concerned in preventing the further spread of the gipsy moth, and therefore work along the western border in the barrier zone and in the towns east of the barrier zone, State funds have been expended in some of the towns known to be infested, chiefly in the central portion of the State. Funds have been inadequate to cover all infested towns. We here express our appreciation and thanks to Mr. A. F. Burgess, in charge of moth work, and Mr. H. L. Blaisdell, both of the Plant Quarantine and Control Administration, for their hearty coöperation.

New Apparatus and Replacements

One piece of new apparatus was purchased this year and two of the old "Model T" Ford trucks were replaced by two new "Model A" light-delivery trucks. Also 1,000 feet of high-pressure hose were purchased to replace that which, from use and atmospheric conditions, had become unfit for further use.

The new piece of apparatus mentioned above was a portable forest fire pump which was purchased at a cost of $585. This pump was used wherever conditions made it possible to pump water from the supply to the sprayer, thus saving the time and labor of driving the sprayer to the supply and back to the place where spraying operations were being carried on.

The usual number of small tools, such as pliers, screw-drivers, and so forth, were also purchased.

Details of the Work by Counties and Towns

As has already been mentioned, on account of a lack of funds, it has been impossible to cover all the towns known to be infested within the State. Consequently, our efforts have been concentrated upon the central portion. The following pages describe the work done in each county and town:

Windham County

The only work done in Windham County this season was in the town of Killingly.

Killingly

A small amount of spraying was done in Killingly at two colonies where prior infestations were known to be present, and where caterpillars were observed this season. During the feeding season, collections were made of all stages of larvae and pupae, and these insects were sent to the Federal Gipsy Moth Laboratory at Melrose Highlands, Mass., in order to determine the degree of parasitism by both the imported and the native parasites. An account of these collections will appear elsewhere in this report.

Tolland County

Bolton

1 Infestation 9 Egg-clusters

A single small infestation was discovered in Bolton, on the property of Mr. Samuel Alvord. The discovery was made last year while the caterpillars were feeding, and 87 egg-clusters were found. The colony was sprayed in 1929, and this year four new and five old egg-clusters were discovered. This colony was again sprayed and we hope has been eradicated.

Ellington

Scouting had just been started in Ellington when it was necessary to remove the men to begin spraying operations. When the scouting ceased, about five and one-half miles of roadway had been scouted, and no infestations were found.

Hebron

2 Infestations 456 Egg-clusters

Two large woodland colonies were discovered in Hebron, one of 269 egg-clusters on property owned by Miss A. White, and another of 187 egg-clusters on land owned by Miss White and Mr. C. Allen. These colonies are situated about one mile west of Hope Valley village. Egg-clusters had hatched and the larvae were feeding when this colony was discovered. A woodland area of about one and one-half acres in extent was sprayed by State men July 8.

Vernon

Vernon was scouted during the last of April and the first part of May, but no infestations were found.

Hartford County

Avon

1 Infestation 7 Egg-clusters

This was a reinfestation of last year's colony situated on Talcott Mountain, where 382 egg-clusters were found. This season only seven egg-clusters could be found and only three of these were new ones. This infestation was on property owned by Mr. W. R. Hodge, and no spraying was done there.

Burlington

2 Infestations 617 Egg-clusters

Only the northwestern quarter of the town of Burlington was scouted in 1930. One large woodland colony of 605 egg-clusters was discovered in an orchard and woodland owned by Mr. Mednausky, and a small colony of 12 egg-clusters in the border of a woodland was found on the property of Mr. S. Schuster. These two colonies were near each other and were situated in the northwest corner of the town. State men sprayed about six acres around these infestations early in June.

East Granby

3 Infestations 64 Egg-clusters

A colony of 35 egg-clusters was discovered in mixed woodland on the west side of the railroad about one mile north of the Granby railroad station. A second colony containing 18 egg-clusters was found in a woodland in the northern central portion of the town, directly north of Peak Mountain and near the Suffield town line. The owners of the property where these two colonies were situated could not be ascertained. A third colony of 11 egg-clusters was found on a maple tree and an oak tree in the dooryard of Mr. W. J. Nicholson about a mile east of East Granby post office. State men in June sprayed 12 acres of woodland at the first colony and 35 shade trees at the third colony.

East Hartford

1 Infestation 2 Egg-clusters

Two egg-clusters, one new and one old, were found at the old infestation in the south central part of the town on property of Mr. H. E. Keeney, about one and one-half miles east of Hockanum. It was considered unnecessary to spray at this infestation.

Glastonbury

1 Infestation 28 Egg-clusters

A colony of 28 egg-clusters was discovered on roadside trees on town property on the west side of Minnachaug Mountain. At this infestation, State men sprayed 10 shade trees, May 23.

Granby

1 Infestation 1,271 Egg-clusters

Granby was used as a school for training State men in 1930. About 80 acres of woodland were scouted in the southwestern corner of the town, on land owned by Mr. Max Schinder, and altogether 1,271 egg-clusters were found, scattered throughout the entire tract. No spraying was done here.

Hartland

6 Infestations 70 Egg-clusters

In Hartland this year State scouts discovered six colonies, all situated along the eastern border of the town. The largest contained 30 egg-clusters. The next largest had 22 egg-clusters, and was in woodland owned by Mr. Lichde in the northeastern corner of the town. The four other colonies were all very small. About nine acres of woodland were sprayed by State men around two of these infestations.

New Britain

4 Infestations 181 Egg-clusters

When scouting New Britain this season, State men discovered a rather large woodland colony of 174 egg-clusters on land owned by Mr. Peter Siering, situated on the north side of Osgood Avenue. The other three infestations had less than five egg-clusters each. On the property of Mr. Siering, about 13 acres were sprayed during the last days of June and the first week in July.

Newington

2 Infestations 7 Egg-clusters

State men scouted Newington this year and discovered two small woodland infestations. One of five egg-clusters was on land owned by Mr. S. Jervis; the other was on land owned by Mr. F. Homes and contained two egg-clusters. Both of these colonies were situated in the extreme southwestern corner of the town, and it was not considered necessary to spray here.

Simsbury

9 Infestations 370 Egg-clusters

The two largest colonies discovered in Simsbury this year were situated in the northwestern corner of the town about a mile north of the reservoir. One was in woodland owned by Ex-Senator G. P. McLean and contained 199 egg-clusters; the other was in a pasture and contained 73 egg-clusters, but the name of the owner could not be learned. The other infestations were small. About 10 acres of woodland were sprayed by State men during the latter part of June.

Southington

1 Infestation 102 Egg-clusters

The only scouting done in Southington this season was in the southwestern portion of the town in and around the infestation found last year on property owned by Mr. S. T. Gridley. Altogether 102 egg-clusters were found this year. Approximately 11 acres of woodland were sprayed, and it is hoped that the colony has now been eradicated.

Suffield

3 Infestations 58 Egg-clusters

When State men scouted Suffield this year, they found two small woodland colonies, situated on the western border of the town near the Granby line; one had 25 egg-clusters and the other had five egg-clusters. A third, and the largest colony, containing 28 egg-clusters, was on an apple tree and fence owned by Mr. George Hastings about one and one-half miles west of Buck Hill. Two of these colonies were sprayed during June by State men.

Wethersfield

1 Infestation 1,598 Egg-clusters

In 1928, a large infestation was discovered in Wethersfield on the bank of the Connecticut River. This has proved one of the most difficult to eradicate of any gipsy moth colony that has ever been found in Connecticut. During the first season after the infestation was discovered, the water flooded the land and spraying had to be abandoned. The next season, 1929, spraying machines were taken to the infestation but there was so much underbrush and fallen timber that an efficient job of spraying could not be done. Moreover, many of the maple and poplar trees were more than 100 feet tall, and even with 1,000 pounds pressure at the

pump, it was impossible to reach their tops. Early in 1930, the brush and dead trees were cut, piled and burned to make it possible to spray this infestation properly. In scouting, 1,598 egg-clusters were found and creosoted. About 15 acres were sprayed and during the coming season we hope that this colony may be eradicated.

West Hartford

1 Infestation 205 Egg-clusters

Last year's infestation on the east side of Talcott Mountain on property owned by the Water Bureau, Metropolitan District Commission of Hartford County, was found to be infested again this year. There was a substantial reduction in the number of egg-clusters, 205 being found this year. During the last of May and the first of June, State men sprayed about 20 acres of woodland here.

Windsor

1 Infestation 2 Egg-clusters

When scouting Windsor this season, State men found a small infestation of two egg-clusters on two oak trees in a pasture owned by Mr. Snow near the Connecticut River and the Hartford town line. Spraying was not considered necessary.

Bloomfield

A small amount of scouting was done in Bloomfield around the old infestations of 1926 and 1927. No trace of the gipsy moth was found.

Other Towns

Other towns in Hartford County scouted this season and in which no gipsy moths were found are as follows: Berlin, East Windsor, Rocky Hill and South Windsor.

Middlesex County

Middlefield

3 Infestations 262 Egg-clusters

In 1929, an infestation containing 418 egg-clusters was found on the estate of the late Charles E. Lyman. This year, the place was again infested, but only 17 egg-clusters could be found. Two new colonies were discovered in woodland on the eastern slope of Beseck Mountain, distributed over a large area; one contained 102, and the other 43 egg-clusters. There are a large number of

land owners in this section, and we were unable to locate property lines or determine who owned the land in the area where the infestation occurred. State men sprayed altogether 41 acres of woodland at these three colonies.

Middletown

2 Infestations 84 Egg-clusters

Two infestations were found in Middletown this season. One had 73 egg-clusters on apple and shade trees owned by Mr. Fene and Mr. C. Brainard on the "Ridge Road." The other colony was about two and one-half miles south of this and contained 11 egg-clusters, on land owned by Mr. Longworth. Both infestations were sprayed by State men late in May.

Other Towns

The towns of Cromwell, Durham and Portland in Middlesex County, were scouted and no trace of the gipsy moth was found.

Litchfield County

Barkhamsted

11 Infestations 420 Egg-clusters

When scouting Barkhamsted this season, State men discovered 11 gipsy moth infestations, all of which were in the eastern half of the town. Eight were in woodland and the other three in apple orchards. Though none of these colonies is very large, three are of sufficient size to warrant mention here. One had 90 egg-clusters and was in woodland owned by the Water Bureau, Metropolitan District Commission of Hartford County, about a mile south of the Barkhamsted post office. Two woodland colonies consisting of 77 and 44 egg-clusters respectively, were found on property owned by Mr. C. H. LeGeyt, directly east of the Barkhamsted post office. The next largest colony, of 72 egg-clusters, was found in an apple orchard owned by Mr. Swallow, about one and one-half miles west of the Barkhamsted post office. During the latter part of June, five of these colonies were sprayed by State men.

Canaan

12 Infestations 415 Egg-clusters

When scouting Canaan this year, Federal men discovered 12 gipsy moth infestations, three of which are considered large colonies for this territory. The largest contained 168 egg-clusters,

and was in woodland owned by Mr. A. Castagna, in the Huntsville district. The second largest contained 100 egg-clusters, and was in woodland owned by Mr. E. B. Tracy, in the northeastern corner of the town. The third in size had 78 egg-clusters and was in woodland owned by the Hollenbeck Club, situated about a mile south of Huntsville. Federal men sprayed altogether 626 acres of woodland at eight of the 12 colonies.

Colebrook

3 Infestations 41 Egg-clusters

Two gipsy moth colonies were found in the southwestern corner of Colebrook, one on land owned by Mrs. H. T. Matheson, and the other on property of the Pinehurst Lakes Club, where 33 and four egg-clusters, respectively, were creosoted. Another colony of four egg-clusters occurred on an apple tree on the land of Mr. E. J. Webb, in the northwestern corner of the town. Nearly half an acre of woodland was sprayed on Mrs. Matheson's property. All work in Colebrook was done by State men.

Cornwall

3 Infestations 52 Egg-clusters

When Federal men scouted Cornwall this year, they discovered three small colonies. Two of them were situated about one and one-half miles south of Coltsfoot Mountain, in woodland owned by Mr. C. J. Patterson. The third contained 24 egg-clusters and was situated on the north slope of Titus Mountain in the northeast corner of the town. About 59 acres of woodland were sprayed by Federal men.

Harwinton

1 Infestation 6 Egg-clusters

The only scouting done in Harwinton this year was around last year's infestation, where six egg-clusters were discovered in woodland owned by Mr. David Mansfield in the Campville post office district. The scouting covered about 20 miles of roadway and was done by State men. As none of the egg-clusters were broken, spraying was deemed unnecessary at this colony.

New Hartford

1 Infestation 75 Egg-clusters

The only scouting in New Hartford this year was done by State men in the southwest quarter of the town, where about 30

miles of roadway were examined. One colony that contained 75 egg-clusters was discovered in woodland, the ownership of which could not be ascertained, about a mile south of the Bakersville post office. Approximately three acres were sprayed at this colony the first of June.

Norfolk

5 Infestations 246 Egg-clusters

Five woodland infestations were discovered in Norfolk this year. Four were situated in the northwest corner of the town near the North Canaan town line, and the fifth was in the northeast corner near the south end of Doolittle Pond. Spraying at four of these colonies covered about 192 acres of woodland. All work in the town was performed by Federal men.

North Canaan

1 Infestation 1 Egg-cluster

The only scouting in North Canaan this season was done by Federal men in woodlands, and 1,284 acres were covered. A single egg-cluster on land owned by the New England Lime Company was the only infestation found and no spraying was done.

Sharon

2 Infestations 19 Egg-clusters

When Federal men scouted the woodlands in Sharon, they discovered two small infestations. One contained three egg-clusters, situated just west of Ellsworth Hill in the southwestern corner of the town; the other was a half mile west of Skiff Mountain, and contained 16 egg-clusters. About 23 acres of woodland were sprayed at these two colonies.

Salisbury

6 Infestations 615 Egg-clusters

Federal men scouted the woodlands of Salisbury this season and discovered six infestations, containing altogether 615 egg-clusters. Three of these colonies were in the northwest corner of the town between Bear Mountain and Lion's Head. The other three were across the Housatonic River from Falls Village. About 135 acres of woodland were sprayed at four of these colonies.

Warren

3 Infestations 63 Egg-clusters

When scouting in Warren, Federal men discovered three small woodland colonies of 63 egg-clusters on the northeast side of the ridge formed by Rabbitt Hill and Town Hill. During the summer 143 acres were sprayed at these colonies.

Other Towns

Several other towns in Litchfield County were scouted and no gipsy moths found, as follows: Goshen, Kent, Litchfield and New Milford by Federal men and Plymouth and Winchester by State men.

New Haven County

Beacon Falls

1 Infestation 117 Egg-clusters

Federal men discovered a colony of 117 egg-clusters this year in Beacon Falls, in woodland owned by the Beacon Falls Rubber Company. When discovered, the eggs had hatched and the larvae were feeding. About one and one-half acres of woodland were promptly sprayed by the Federal men.

Branford

1 Infestation 430 Egg-clusters

Late in the season, our attention was called to a gipsy moth infestation in the village of Branford. State men were immediately sent to scout the area and they found that a rather large colony had been built up before being discovered. Altogether 430 egg-clusters were found scattered throughout a greater portion of the village. All trees in the village north of the railroad were sprayed the last of May and early in June. We take this opportunity to thank the town officials and property owners of Branford for their courtesy, hearty coöperation and help in every possible way to eradicate this infestation.

Meriden

5 Infestations 353 Egg-clusters

State men discovered two large infestations on the summit of West Peak, containing 349 egg-clusters in woodland owned by the

City of Meriden, the State of Connecticut, and Mr. C. J. Danaher. These two colonies were close together and approximately 127 acres were scouted in the vicinity of West Peak. Three other small colonies, one of two-egg clusters, and two of a single egg-cluster each, were found within the town limits. In June, two machines were operated in spraying around the infestations at West Peak, where 90 acres of woodland were covered. It is hoped that this work has been sufficient to eradicate the pest at these infestations.

Wallingford

3 Infestations 551 Egg-clusters

All work in Wallingford this year was done by the Federal men, who found a reinfestation around last year's colony in the northwestern corner of the town; only 36 egg-clusters were found this year where 298 occurred last season. About 35 acres of woodland were sprayed around this colony. Two new colonies containing 516 egg-clusters were discovered in the northeastern corner of the town on Beseck Mountain, where about 240 acres of woodland were sprayed.

Other Towns

Seventeen other towns in New Haven County in which no gipsy moth infestations were found, were scouted by Federal men as follows: Ansonia, Bethany, Cheshire, Derby, East Haven, Hamden, Middlebury, Milford, Naugatuck, New Haven, Orange, Oxford, Prospect, Seymour, Southbury, West Haven and Woodbridge.

New London County

The only work done in New London County this year was in the town of Colchester where State men scouted around former infestations. About 16 miles of roadway were covered and no gipsy moths found.

Fairfield County

The only work done in Fairfield County this season was in the town of Fairfield, where Federal men scouted around the old infestation on Mr. Sewell's place on Roanoke Avenue. No trace of the pest was found.

STATISTICS OF INFESTATIONS

1929-1930

Towns	No. infestations found	No. egg-clusters creosoted	No. colonies sprayed	No. lbs. poison used	No. larvae and pupae killed	No. miles roadway scouted
Windham County						
Killingly	0	0	2	25	0	0
Tolland County						
Bolton	1	9	1	50	0	43
Ellington*	0	0	0	0	0	5
Hebron	2	456	2	300	0	31
Vernon	0	0	0	0	0	56
	3	465	3	350	0	135
Hartford County						
Avon*	1	7	0	0	0	17
Berlin	0	0	0	0	0	50
Bloomfield*	0	0	0	0	0	3
Burlington*	2	617	2	1,501	8	16
East Granby	3	64	2	648	12	42
East Hartford	1	2	0	0	0	50
East Windsor	0	0	0	0	0	73
Glastonbury	1	28	1	3	0	118
Granby*	1	1,271	0	0	0	80 acres
Hartland	6	70	2	290	19	65
New Britain	4	181	1	700	0	43
Newington	2	7	0	0	0	39
Rocky Hill	0	0	0	0	0	30
Simsbury	9	370	3	455	2	91
Southington*	1	102	1	386	0	13
South Windsor	0	0	0	0	0	74
Suffield	3	58	2	55	2	103
Wethersfield	1	1,598	0	0	0	15 acres
West Hartford*	1	205	1	544	0	18
Windsor	1	2	0	0	0	81
	37	4,582	15	4,582	43	926
Middlesex County						
Cromwell	0	0	0	0	0	34
Durham	0	0	0	0	0	22
Middlefield	3	262	3	1,320	0	21 260 acres
Middletown	2	84	2	88	0	102
Portland	0	0	0	0	0	64
	5	346	5	1,408	0	243
Litchfield County						
Barkhamsted	11	420	5	1,942	50	82
Canaan†	12	415	8	25,659	0	10,178 acres
Colebrook	3	41	1	37	5	67
Cornwall†	3	52	1	1,590	0	16,173 acres

* Scouted around old infestations.
† Scouted by Federal men.

Towns	No. infestations found	No. egg-clusters creosoted	No. colonies sprayed	No. lbs. poison used	No. larvae and pupae killed	No. miles roadway scouted
Litchfield County—*Cont.*						
Goshen†	0	0	0	0	0	18,730 acres
Harwinton	1	6	0	0	0	20
Kent†	0	0	0	0	0	17,547 acres
Litchfield†	0	0	0	0	0	18,174 acres
New Hartford*	1	75	1	75	0	28
New Milford‡	0	0	0	0	0	0
Norfolk†	5	246	4	6,995	0	21,998 acres
North Canaan†	1	1	0	0	0	1,284 acres
Plymouth*	0	0	0	0	0	4
Salisbury†	6	615	4	6,050	0	18,023 acres
Sharon†	2	19	2	1,200	0	17,482 acres
Warren†	3	63	3	6,480	0	10,049 acres
Winchester*	0	0	0	0	0	4
	48	1,953	29	50,028	55	205
Woodland acres						149,638
New Haven County						
Ansonia†	0	0	0	0	0	39
Beacon Falls†	1	117	1	1,260	0	21
Bethany†	0	0	0	0	0	62
Branford	1	430	1	2,625	0	47
Cheshire†	0	0	0	0	0	93
Derby†	0	0	0	0	0	32
East Haven†	0	0	0	0	0	45
Hamden†	0	0	0	0	0	107
Middlebury†	0	0	0	0	0	60
Milford†	0	0	0	0	0	86
Naugatuck†	0	0	0	0	0	66
New Haven†	0	0	0	0	0	210
Orange†	0	0	0	0	0	51
Oxford†	0	0	0	0	0	77
Prospect†	0	0	0	0	0	40
Seymour†	0	0	0	0	0	55
Southbury†	0	0	0	0	0	126
Wallingford†	3	551	3	11,430	0	6,677 acres
West Haven†	0	0	0	0	0	95
Woodbridge†	0	0	0	0	0	55
	5	1,098	5	15,315	0	1,367
Woodland acres						6,677
New London County						
Colchester*	0	0	0	0	0	16
Fairfield County						
Fairfield*	0	0	0	0	0	0

* Scouted around old infestations.
† Scouted by Federal men.
‡ Scouted around old infestations by Federal men.

SUMMARY OF STATISTICS

County	No. towns covered	No. infestations found	No. egg-clusters creosoted	No. colonies sprayed	No. lbs. poison used	No. larvae and pupae killed	No. miles roadway scouted
Windham	1	0	0	2	25	0	0
Tolland	4	3	465	3	350	0	135
Hartford	20	37	4,582	15	4,582	43	926
Middlesex	5	5	346	5	1,408	0	243
Litchfield	17	48	1,953	29	50,028	55	205
New Haven	20	5	1,098	5	15,315	0	1,367
New London	1	0	0	0	0	0	16
Fairfield	1	0	0	0	0	0	0
	69	98	8,444	59	71,708	98	2,892

Acres woodland scouted

Hartford	95
Middlesex	260
New Haven	6,677
Litchfield	149,638
Total acres	156,670

Financial Statement

RECEIPTS

Appropriation for year ending June 30, 1930	$50,000.00
Rebate on overcharge for gasoline	7.90
	$50,007.90

EXPENDITURES

Salaries		$ 4,836.00
Labor		36,166.36
Stationery and office supplies		42.41
Scientific supplies, chemicals		43.05
Sundry supplies:		
Insecticides	$1,046.40	
Small hardware	9.84	
Auto oil	20.10	
		1,076.34
Communication service, telephone		65.09
Travel expenses:		
Outlying investigations	$ 480.62	
Gasoline	1,167.45	
		1,648.07
Express		61.64
Heat, light, water and power:		
Fuel, coal	$80.00	
Light, electricity	31.84	
		111.84
Tools, machinery and appliances:		
Motor vehicles	$ 593.00	
Other equipment	1,500.58	
Auto repairs	912.06	
Other equipment repairs	462.15	
		3,467.79
Rent of office, storehouse and auto storage		509.25
Insurance		623.99
Contingent		454.00
Total expenditures		$49,105.83
Balance on hand June 30, 1930		$902.07

Parasites and Natural Enemies

In the Report for 1922 (see Report, Conn. Agr. Expt. Station for 1922, pages 313-317) is a list of parasites that have been imported from foreign countries by the United States Bureau of Entomology. They have been distributed in the New England States and since recovered in Connecticut. It is unnecessary to describe them here, but it is sufficient to state that nine of them, and possibly more, have become established in Connecticut, and some of them may be expected to help in checking the gipsy moth.

During the summer, Mr. Ashworth made collections of gipsy moth caterpillars and pupae in Thompson, and sent them to the Federal parasite laboratory at Melrose Highlands, Mass. The first collection of 78 first-stage larvae, and 22 second-stage larvae, gave no parasites. The second collection of four first-stage larvae, 92 second-stage larvae, and four third-stage larvae, produced 12 individuals of a four-winged or hymenopterous parasite, *Apanteles melanoscelus* Ratz. The third collection of 20 third-stage larvae, 76 fourth-stage larvae, and four fifth-stage larvae, gave 14 two-winged flies or dipterous parasites of the species *Compsilura concinnata* Meigen. The fourth collection of 60 fifth and sixth-stage larvae, gave two-winged flies or dipterous parasites as follows: 21 *Sturmia scutellata* Rob.-Desv., and one *Compsilura concinnata* Meigen. A collection of 29 male and 28 female pupae, gave 18 *Sturmia scutellata* Rob.-Desv.

The following parasites and natural enemies of the gipsy moth have been liberated in Connecticut during the past season: *Sturmia scutellata,* formerly known as *Blepharipa scutellata,* was liberated in Barkhamsted and Granby, August 22, by the Plant Quarantine and Control Administration, from Melrose Highlands, Mass. One wooden box containing puparia was placed in each town. An examination of two boxes from the same lot gave an average emergence of 2,300 flies from each box.

The large imported *Calosoma* or ground beetle, *Calosoma sycophanta* Linn., both larvae and adults of which feed upon gipsy moth larvae and pupae, was also liberated in Granby and Wethersfield by the Bureau of Entomology, 1,000 adult beetles in Granby and 800 in Wethersfield.

Barrier Zone

Several years ago it was suggested that a barrier zone be established along the western border of the infested area, extending from the Canadian border southward to Long Island Sound, in and beyond which the gipsy moth should not be allowed to gain a foothold. This plan seems to be the best one yet proposed for the protection of New York and the country westward. New York officials are much concerned over the matter because if the

gipsy moth should become thoroughly established in the extensive forest areas of the Catskill and Adirondack Mountains, it would

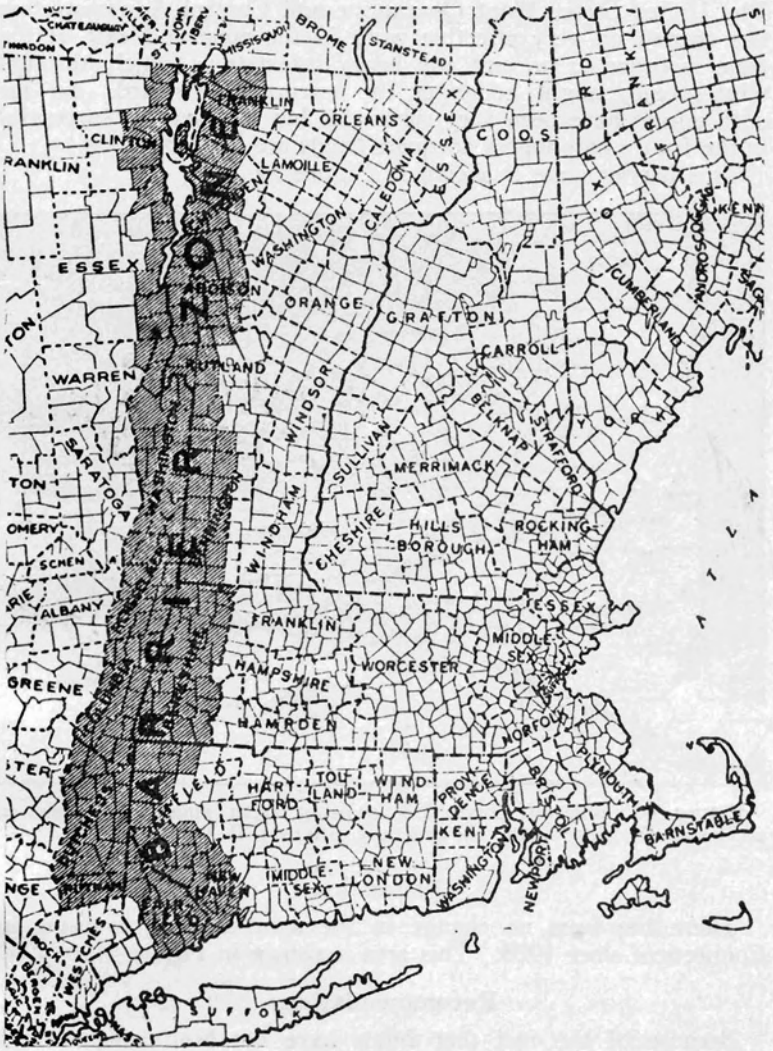

FIGURE 39. Map showing barrier zone extending from Long Island Sound to the Canadian border. (Adapted from Burgess, Farmers' Bulletin 1623, U. S. Dept. Agr.)

be well-nigh impossible with any reasonable appropriations to eradicate it. Of course, the gipsy moth has no respect for the

barrier zone and many incipient colonies have been found in it. A few colonies have even been discovered west of the zone but were promptly eradicated by the New York State authorities. The United States Plant Quarantine and Control Administration has carried on very effective work in the zone and east of the zone in order to prevent any heavy infestations which, through wind-spread, might endanger the territory westward. So far such efforts have been very successful but they can be successful in the future only unless adequate funds are available.

This barrier zone is shown in Figure 39.

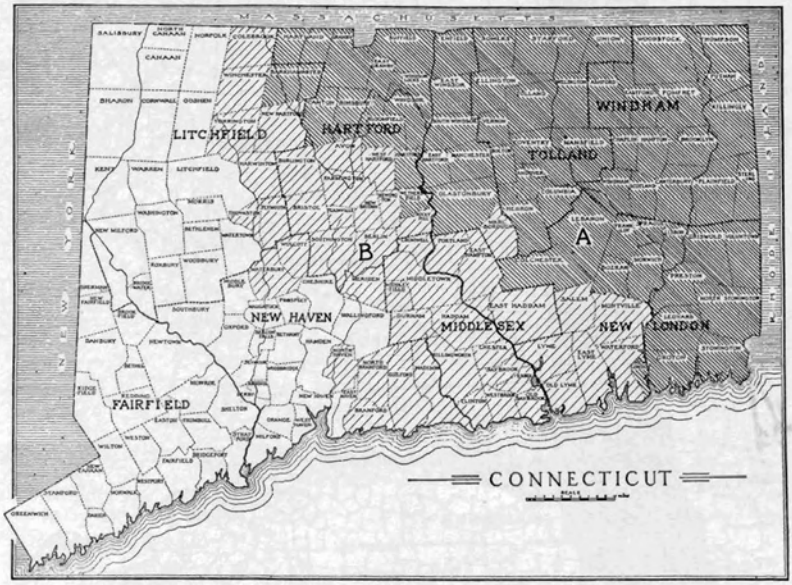

FIGURE 40. Map of Connecticut showing areas under quarantine on account of the gipsy moth. A, generally infested; B, lightly infested.

Quarantine

There has been no change in the area under quarantine in Connecticut since 1928. This area is shown in Figure 40.

Recommendations

Because of the fact that funds have not been adequate for scouting all of the infested towns, and of the danger of large colonies being built up in strategic situations and becoming a menace to the territory to the westward, we have requested that the appropriation be increased to $120,000 for the next biennial period instead of $100,000, the amount granted by the General Assembly in 1923, 1925, 1927 and 1929.

EMERGENCE RECORDS OF THE APPLE MAGGOT

M. P. Zappe

During the last few years, the apple maggot or railroad worm, *Rhagoletis pomonella* Walsh, has been unusually abundant. It has always been present in early varieties of apples, particularly the sweet and sub-acid ones, but for several years it has increased in later varieties. McIntosh apples were not heavily infested a few years ago, but now some growers report heavy losses in this variety due to the ravages of the insect. One grower lost his entire crop of McIntosh two years ago. The variety Wealthy, which matures rather early, is also becoming a favorite host for the apple maggot; even Baldwin, which in Connecticut has been almost immune, is also being attacked by this pest. Certain growers have been accustomed to stop their spraying operations after the calyx spray or with the seven-day spray (one week later than the calyx application). These growers are the ones who have suffered most.

In normal seasons, the calyx spray is applied during the latter part of May and this application is too early to have much effect on the apple maggot. Those growers who continue their spraying operations through June have less injury from this pest. It is not particularly hard to control, provided a spray of arsenate of lead is applied at the proper time. This should be about July 1 and another application should be made two weeks later.

Life History

The life cycle of this insect may be stated briefly as follows: The female flies puncture the skin of the apples and insert their eggs just under the surface. This usually takes place about July 15, depending on the variety attacked. Flies that matured from last year's early fruit will emerge a little earlier than flies from late fruit.

The eggs hatch in the green apples in from two to ten days and the young maggots begin to tunnel through the fruit. At first their development is rather slow, but as the fruit ripens they grow much faster. When the maggots are full grown, they leave the apples and enter the ground. A few days after the larvae enter the ground they change to the pupal stage and remain in the ground until the following June or July. At this time the adult flies begin to emerge and in about ten days to two weeks are ready to lay their eggs.

This is the general life cycle and applies to most of the individuals of this species, but there are variations. Occasionally, flies emerge the same summer that the maggots have entered the ground. This makes a second brood, adults of which emerge

from the ground about the middle of September. This second brood never does any damage because by the time the eggs in the bodies of the females are developed for oviposition, it is close to the first of October and then most of the fruit has been harvested and colder weather stops their activities.

There is still another exception to the regular life cycle. A few individuals fail to emerge at the time when the majority of the flies are coming from the ground. These individuals remain in the ground another year and emerge the following summer. This makes a two-year cycle and assures the survival of this pest in cases of crop failures.

EMERGENCE OF APPLE MAGGOT FLIES

1930	McIntosh	Porter Hurlbut	Baldwin	1930	McIntosh	Porter Hurlbut	Baldwin
June 30	0	2	0	July 16	1	1	0
July 1	2	2	0	" 17	0	2	1
" 2	4	1	1	" 18	2	2	0
" 3	2	0	0	" 19	1	1	0
" 4	0	0	0	" 20	2	0	0
" 5	3	2	0	" 21	3	0	0
" 6	3	2	0	" 22	3	1	0
" 7	4	0	1	" 23	0	0	0
" 8	8	1	0	" 24	4	3	0
" 9	1	3	3	" 25	1	0	0
" 10	8	3	0	" 26	0	0	0
" 11	7	4	1	" 27	0	1	0
" 12	2	0	0	" 28	0	1	0
" 13	4	1	0	" 29	0	0	0
" 14	2	1	1	" 30	0	0	0
" 15	1	1	0				

During the fall of 1929, apples infested with this insect were gathered and placed in ground cages where the emergence of the adults could be observed. McIntosh apples were placed in one cage, Baldwin in another, and Porter and Hurlbut in a third cage. The first adults appeared in the Porter and Hurlbut cage on June 30, and the last one to emerge was also from this cage July 28. In the McIntosh cage, the first fly appeared on July 1, and the last on July 25. The fruit in the Baldwin cage was not so heavily infested; the first fly appeared on July 2, and the last on July 17. The peak of emergence in all varieties was between July 8 and July 12. Allowing 10 days for the eggs in the ovaries of the female flies to develop, the peak of egg laying would be around July 20. An arsenical spray applied soon after July 4 is recommended. A thorough spraying at this time kills many of the flies before they can begin laying eggs.

ORIENTAL FRUIT MOTH WORK IN 1930

PHILIP GARMAN

In 1929, through the activities of the Connecticut Pomological Society, funds were made available for breeding parasites of the Oriental fruit moth. An emergency fund of $5,000 was provided by the State, and the growers subscribed $2,000 additional. With these appropriations, apparatus was constructed, stocks of parasites acquired, and the work begun during the fall of 1929 and winter of 1930. We have kept two to three men continuously busy since the work was started, and in addition have required extra help during certain periods. Our equipment, largely homemade, consists of three large incubators specially designed and constructed by Mr. Walden and Mr. Townsend. These are each provided with heaters, fans and thermostats so that uniform conditions are maintained throughout.

In addition, the work required the use of an electric refrigerator, which was provided with a special cooling unit. For breeding *Sitotroga* (grain moths) a room 10 by 10 by 7 feet in size was used, where, during the winter. it was found necessary to provide moisture only, which was furnished by an electric (Braemer) humidifier. Heat was supplied by steam pipes running through the room, which, being located in a basement, needed no provision for either heat or moisture during the summer, since conditions normally present were sufficient to keep up production. A large steam radiator was installed in this room, by means of which, with the aid of several electric heaters, the entire room with grain was heated to 140° F. before inoculating the grain with moth eggs. It was hoped that this treatment would kill off injurious mites or beetles which might interfere with development of the grain moths. The worst enemies were apparently killed, although the room has since become infested with species of lesser importance. These have not proved serious.

For handling *Macrocentrus* special cages were built, the ones now in use consisting of cloth-covered frames about 26 by 36 by 14 inches in size. These cages were also used for peach moth egg production and were placed over potted seedlings or peach twigs on a greenhouse bench. In order to handle peach moths and their larvae in considerable quantities, shallow milk pans clamped together were used. In these, fruit moth eggs were placed with suitable food.

It was soon found that *Macrocentrus* breeding was not progressing satisfactorily, so it became necessary to send to New Jersey for material with which to supply the various growers. In order to handle this material successfully, another 7 by 7 by 7 foot cage was constructed, with the use of dark cloth except for a light

cloth screen window on which the parasites congregated. For collection of *Macrocentrus,* a suction apparatus similar to those in use in other laboratories was employed, with the exception that the insects were sucked directly into the container in which they were shipped. Shipping boxes consisted of ice cream containers lined with moist blotting paper, the top cut in and covered with cheese cloth and the bottom with a hole plugged with a cork containing a small amount of honey. These boxes were provided with 50 to 100 parasites each, packed in moist sphagnum moss within a larger paper carton, and mailed. Reports from some 20 per cent of the growers indicated that practically all investigated came through in good condition.

During the summer approximately 4,000,000 *Trichogramma* were mailed to growers, and in addition, almost 2,000,000 were placed, experimentally, in several orchards. Nearly 2,000,000 more, not distributed, have also been reared. To rear the required number of grain moths, we used 1,100 pounds of hard wheat. We have lately added two units to our equipment and will be able to increase our production considerably next year.

As regards *Macrocentrus* production, we secured a total of 11,600 this year, more than 9,000 of which were reared from twigs collected in New Jersey by Mr. Brigham and Mr. Lewis.

The remaining parasites were supplied through the courtesy of Dr. H. W. Allen of the United States Department of Agriculture at Moorestown, N. J. In our laboratory breeding work, we have reared about 11,000 *Macrocentrus* which were, however, not used for distribution.

In connection with some of the breeding work with fruit moths, it was found possible to rear them in winter under greenhouse conditions in considerable numbers. Thus, during February and March of 1930, we produced 12,000 eggs from which about 3,000 spun larvae were secured. The decrease in number of mature larvae from the large number of eggs, was probably due to fruit rot and inexperience in handling at this time of year. During the summer of 1930, we have reared more than 12,000 larvae, of which we now have 4,000 to 6,000 in storage, together with 3,000 to 5,000 parasites. Our greatest egg yield from cages already described amounted to more than 4,000 in a single day though normally production has been much less. The greatest number obtained in one day during the winter was 1,300.

This year it was felt that every grower who subscribed to the parasite fund should be supplied with parasites. Consequently, we divided the supply among them as equally as possible, supplying those who gave the larger amounts with larger or additional shipments. Shipments of *Trichogramma* were begun in June and continued into July. Experimental liberations were made in July and August. A large number of those subscribing to the fund have orchards of one to three acres. These were all supplied

with 40,000 *Trichogramma* early in June (12,000-40,000 per acre). Later shipments of *Macrocentrus* consisted of 50 per subscriber or 15 to 50 per acre. We believe the smaller growers have been fairly well supplied in 1930, but it is the larger growers who form possibly 20 per cent of the total number that need further attention. In districts where injury is just beginning, it is furthermore advisable to make repeated attempts to introduce *Macrocentrus* in order to allow it, if possible, to prevent severe damage such as occurred generally in Connecticut orchards in 1929. Figure 41 shows the location of orchards where parasites were liberated in 1930.

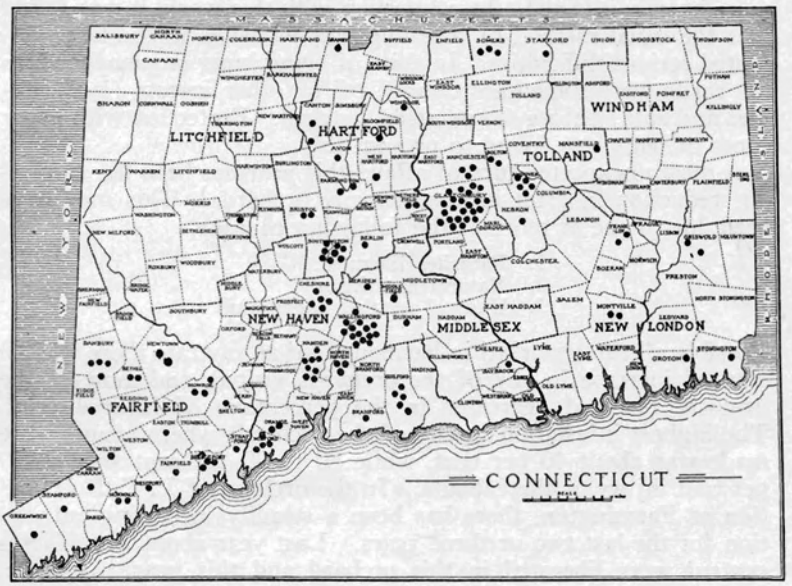

FIGURE 41. Map of Connecticut. Black dots represent the localities where parasites of the Oriental fruit moth were liberated in 1930.

As to liberations, we have confined our work this year largely to experiments in production and distribution, with limited field counts and observations. Twigs collected in 14 orchards showed the presence of *Macrocentrus* in eight of them. In six of these, *Macrocentrus* was liberated for the first time this year. This means a recovery of *Macrocentrus* in about 50 per cent of the orchards in which they were introduced. In none of the orchards where *Macrocentrus* parasites were liberated was there any great increase in parasitism such as has been reported in some localities. Recovery of the species in Root's orchard at Farmington showed that they will pass the winter in such orchards, but as yet there has been no great increase in parasitism here by this species. *Macro-*

centrus was again collected in the Barnes orchard at Wallingford, where it has apparently been present continuously since 1926.

Trichogramma parasites were observed in several orchards, but owing to the difficulty of obtaining accurate counts, and the amount of time involved in so doing, our data are not extensive. They were observed at work in several orchards, though they were apparently not so abundant at New Haven on the Experiment Station grounds as a year ago. Shortly after making liberations of this species at Platt's orchard in Milford, a count was made which showed more than 50 per cent of the eggs to be parasitized. About 10 per cent of the fruit was infested, occasional trees being more heavily infested. In connection with this work, it was found that the usual method of handling egg parasites in the field presented serious difficulties. In spite of being hung on slender wires the cards were sometimes cleaned off by other insects (lacewing-flies and ants) before the parasites hatched. Protection with paper cones or bags was found to prevent this.

A most unexpected turn of affairs this year has been the surprising reduction in fruit injury in many orchards. This may have been due to one or more of the following causes:

1. Parasites liberated.
2. Natural parasitism.
3. Unusual weather conditions.

Possibly all three worked in harmony, but at any rate there was no sign of increase in any of the orchards visited, and most of the growers reported decreases in the percentage of injured fruit. The highest infestation in any of the orchards where counts were made was about 40 per cent, while 80 to 90 per cent showed 10 per cent injury or thereabouts. In the orchard of L. C. Root and Son at Farmington, there has been a steadily increasing infestation for the last two or three years. Last year about 300 *Macrocentrus* were liberated in this orchard and this year 125 more. In August, more than 500,000 *Trichogramma* were liberated, some being placed in paper bags for protection. Both species have now been recovered from this orchard and in addition several species of *Glypta* have been found in some abundance. With these conditions it is easy to explain the fact that less than 10 per cent of the fruit was infested by peach moth in the face of an expected increase over last year, but we still have some of the outside factors at work, which without much doubt helped to lower the infestation. The only orchard reported to have been heavily infested is located in Fairfield County and is one in which experimental work was carried on several years ago. This orchard had no parasites this year. The fact, however, does not prove the case for the parasites entirely, since other orchards that received no parasites reported reduction in peach moth injury. There remains, as will be seen, much to be done before we can come to any definite conclusions

regarding the degree of control effected by introduction or natural occurrence of parasites, and we shall in all probability make a systematic effort to do this next year.

The work of producing *Trichogramma* was handled this year by Mr. Schread and the success of the undertaking is largely due to his efforts. Mr. Brigham and Mr. Lewis were stationed in New Jersey during June and July for the purpose of collecting parasitized fruit moth and leaf roller larvae, while Mr. Townsend handled the imported material at this end. Both Mr. Townsend and Mr. Brigham have been engaged in *Macrocentrus* breeding during the summer and have constructed on the grounds much of the apparatus and cages used during the course of this season's work.

APPLE LEAFHOPPERS IN CONNECTICUT

PHILIP GARMAN

Apple leafhoppers were very injurious in Connecticut orchards in 1930. Two species, the rose leafhopper, *Empoa rosae* Linn.,[1] and the apple leafhopper, *Empoasca fabae* Harris,[1] were involved, although the former was apparently more numerous at New Haven. These two species have different life histories, according to several authors, who state that the rose leafhopper hibernates in the egg stage upon rose and apple. The egg is inserted just beneath the surface of the bark, the favorite location being around the bases of the lowest limbs or on the trunk just below the first branches. The apple leafhopper, on the other hand, winters in the adult stage, emerges in early spring, and flies to apple trees, where eggs are laid in the veins of the leaves, usually terminal. The apple leafhopper infests a great variety of plants, the most commonly infested species being clovers, potatoes and apples. The rose leafhopper feeds upon and may injure any plant of the family Rosaceae, but is commonly found on rose bushes near the orchard. Apparently two generations of each of these species exist in Connecticut, although Ackermann (1) indicates that there may be three of *Empoasca fabae* (*mali*) in the vicinity of Chester, Pa.

The injury from leafhoppers consists mainly of curled terminal leaves and light colored stippling of the older leaves, which may become almost white in color when the pest is abundant. They are said to be important disseminators of fire blight. Discoloration of the fruit by excrement may also be mentioned, the latter

[1] There are also several other species known to occur on apple. The two mentioned are probably the most important in Connecticut.

sometimes being so bad as to require measures for its removal, as shown on Plate 13 a.

For an insect capable of so much damage, there is a surprising lack of information in regard to control measures for mature apple trees. The control of *E. fabae* on potatoes has been frequently investigated and practically all controls recommended for it on this host include the use of Bordeaux mixture. On apples it is not possible to apply Bordeaux mixture at all periods of development, although such a spray might be employed to advantage in midsummer. Oils have been advocated to control the eggs, but we find little evidence in the literature that controls are afforded by these applications. On the contrary, there are statements that indicate a maximum of 50 per cent of the eggs is killed by delayed dormant oils, which is considered of little benefit. These same authors investigated summer oils (3) with poor results and used nicotine dusts (2.8 per cent) which gave somewhat better control, but were considered uncertain and expensive. Ninety-nine per cent of nymphs may be destroyed by applications of nicotine sulfate (1-800) and lime sulfur (1-50) mixture applied at the calyx period and should, with other sprays needed before and after, afford a fair control of the leafhopper situation.

However, when hoppers are numerous in the vicinity upon other unsprayed apple trees or alternate hosts, control may not be complete or even satisfactory. It is, therefore, important to consider removal of weeds harboring them or treatment of roses, currants or gooseberries in the vicinity. As to the summer broods of both species, the problem is much more difficult and few suggestions have been offered. Lathrop (2) states that a very successful spray for use on nursery stock consists of 60 pounds of lump lime, four pounds of copper sulfate and 100 gallons of water. Although this formula might be used on bearing apple trees in modified form, its recommendation at this time is doubtful.

Parasites of the two leafhoppers mentioned are not numerous. The most efficient are said by Ackerman (1) to be the two species, *Anagrus epos* Girault and *Anagrus armatus* Ashmead var. *nigriventrus,* which attack the eggs of the rose leafhopper. These parasites destroyed 65 to 70 per cent of the winter eggs at Chester, Pa., in 1916. Adults of *E. fabae* are parasitized by a dryinid, *Aphelopus albopictus* Ashmead, the larvae of which hang on by attaching themselves near the bases of the wings. In France still other dryinids, and a small pipunculid fly, *Ateleneura spuria* Meigen, are recorded. Mites, spiders, coccinelids, syrphid larvae, the larvae of lacewing flies and the hemipteron *Triphleps insidiosus* Say, have been observed feeding on the nymphs, but are regarded as negligible factors in leafhopper control.

References

(1) ACKERMAN, A. J. Two leafhoppers injurious to apple nursery stock. U. S. Dept. Agr., Bull. 805. 1919.
(2) LATHROP, F. H. Leafhoppers injurious to apple trees. N. Y. (Geneva) Agr. Exp. Sta., Bull. 451. 1918.
(3) 1926-1927. Ohio Agricultural Station, 46th Annual Report, 48.
(4) SCHOENE, W. J. Leafhopper association on apple. Jour. Econ. Ent., 23: 177-191. 1930.
(5) HEADLEE, T. J., MARTIN, W. H., and FARLEY, A. J. Spraying recommendation for apples. N. J. Agr. Exp. Sta., Circ. 220, 7. 1930.

SELECTION AND COMPATIBILITY OF OIL SPRAYS

PHILIP GARMAN

In order to aid in the selection of oil sprays for Connecticut fruit trees, the following points have been listed and may be used as a gauge for measuring oils offered for sale in the state. An ideal oil spray for fruit trees, in our estimation, should:

1. Be non-injurious to trees and operators. Safety is most important.
2. Have sufficient killing power to control insects for which it is applied.
3. Be so standardized that uniformly good results may be obtained from year to year.
4. Be so prepared as to withstand freezing.
5. Mix readily so as to avoid loss of time in preparation.
6. Show compatibility with fungicides.
7. Be easily available and reasonable in cost.

The following notes bear on some of the above points by way of explanation. It should be stated that there are probably few or no oils on the market to-day that meet all of these specifications.

1. Oil content determines dilution and is important in consideration of market quotations. It also influences freezing since preparations much below 80 per cent will freeze readily.

2. The emulsifier influences stability, and indirectly, safety. It also influences compatibility and killing power for some insects. Unstable or quick-breaking emulsions usually have greater killing power for the insects hit, but are less safe, since the oil tends to concentrate about buds or in other locations and there is greater difficulty in covering the tree thoroughly in the dormant period. Properly stabilized oils are compatible with the common fungicides, such as lime-sulfur and Bordeaux mixture.

3. Degree of oil sulfonation influences safety, particularly for summer oils. This is not so important for winter oils. The more an oil is cleaned out by sulfonation, the greater the safety. White oils used in preparation of summer oil emulsions are usually 90 to 100 per cent cleaned out. Phenol or crescylic acid content also influences safety—the more crescylic acid, the more burn. How-

ever, considerable increase in insecticidal action usually attends its use.

4. Viscosity influences ease of handling; the heavier the oil

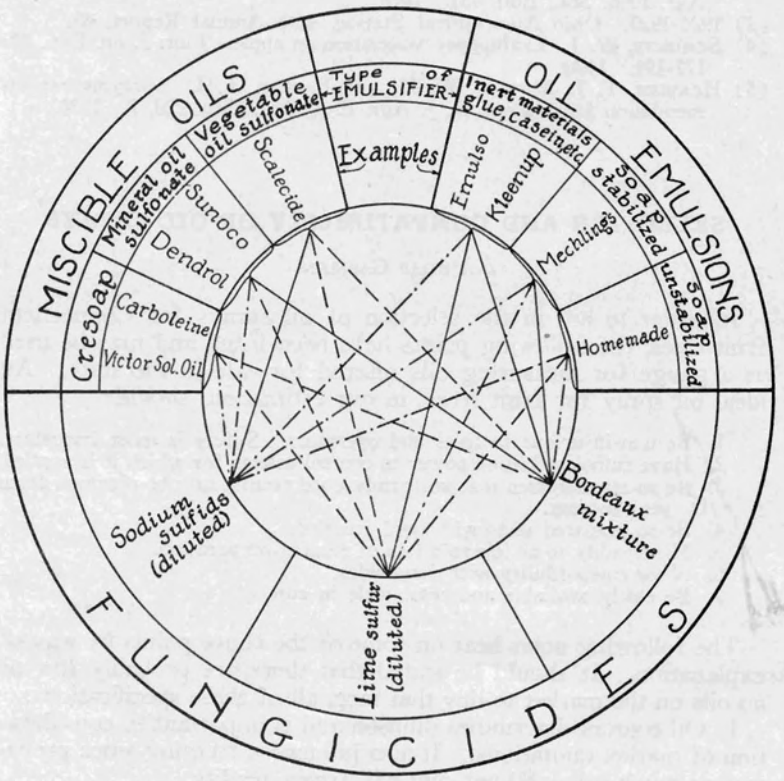

FIGURE 42. Compatibility chart showing which spray materials may safely be mixed with oils.

EXPLANATION

Compatible ————————

Not compatible — — — — — —

Compatible but not usually recommended — - — - — -

Cresoap. Mixture of cresol or cresylic acid and soap.

Sulfonate. Products usually made by treatment of oils with sulfuric acid.

Stabilized. Containing gums, glues or other materials to prevent the emulsion from breaking when mixed with hard waters, lime, lime-sulfur or Bordeaux mixture.

the more difficult it is to handle. The higher viscosities are more effective against some insects.

In order to give some easily understood scheme for mixing oils and fungicides a compatibility chart, suggested by Mr. R. K. Clapp

of the New Haven County Farm Bureau, is shown in Figure 42. The commercial preparations noted are examples commonly encountered in Connecticut, but it will be possible for anyone to insert the oil in which he is interested in its proper group and thereby obtain the necessary information regarding miscibility with fungicides.

The data should not be construed as recommendations for any particular product. It should also be understood that combinations of oils and fungicides may result in increased spray burn, but so far as is known, the insecticidal efficiency is not usually lowered.

It is believed by some that fungicides are not necessary at this period for scab control, although others feel that better control is obtained. Except in the case of Bordeaux mixture, the fungicides should be used at partial or summer strength rather than full winter strength.

AN OUTBREAK OF THE SADDLED PROMINENT IN CONNECTICUT

Heterocampa guttivitta Walker

W. E. Britton

On July 26, 1930, specimens were received from Norfolk, where maple shade trees were being defoliated by two kinds of caterpillars. Some of the caterpillars were the green striped maple worm, *Anisota rubicunda* Fabr., and the others were the saddled prominent, *Heterocampa guttivitta* Walker. Mr. Walden and Mr. Stoddard visited the region on July 30, and found that the greater proportion of the caterpillars belonged to the latter species. A maple tree in front of the house showed considerable defoliation, but the caterpillars seemed to be about through feeding. Some defoliation was evident on the hillsides of the region and another spot of injury was noticed about five miles away toward Torrington.

Further material from Norfolk was received from another correspondent on August 4, and specimens from Canaan Mountain, East Canaan section, were brought to the Station on August 13.

Mr. Stoddard made a later trip to the locality visited on July 26, and noticed a marked increase in the amount of defoliation, and the partially stripped trees could be seen for a distance of at least a mile on the east side of Canaan Mountain.

According to Mr. C. W. Collins, of the Gipsy Moth Laboratory, Melrose Highlands, Mass., who drove through the Berkshire region early in September to make observations on defoliation by this insect, there was a large stripped area on Canaan Mountain

and some light feeding east of the State highway in Kent. In northern Berkshire County, Mass., there was heavy defoliation between Pittsfield and North Adams, extending eastward over the Mohawk Trail as far as Charlemont and Buckland. Mr. Collins expects that defoliation by the saddled prominent will occur next season, and that it may be more severe than in 1930.

Former Outbreaks

An outbreak of this insect occurred in Androscoggin, Oxford, Cumberland, Kennebec and Somerset Counties, Maine, in the central portion of New Hampshire, in western Massachusetts, and in southern Rensselaer County, N. Y., in 1907 and 1908. In Maine for a distance of more than 40 miles across southern Oxford, Cumberland and Androscoggin Counties the forest growth was defoliated. We have no records of this outbreak reaching into Connecticut.

Again in 1917 and 1918, there was an outbreak of this insect. This time the damage extended over portions of western New York, Vermont, New Hampshire, western Massachusetts, and northwestern Connecticut. Large areas were defoliated in Berkshire County, Mass., and in the vicinity of Norfolk, Conn., in 1918 woodland areas of perhaps half a square mile in extent were stripped. In Vermont defoliation occurred in portions of Bennington, Windsor, Orange and Orleans Counties.

Food Plants

The caterpillars attack chiefly the beech and birch trees in the woodland, but they also feed upon maple, apple, oak, cherry, poplar, hop-hornbeam, and a great many other trees and plants. Evidently the beech is preferred.

Life History and Habits

The eggs are apparently laid singly upon the leaves, and the tops of the trees are the first to show defoliation. The insect is normally rare, but occasionally becomes abundant and strips hardwood trees in the northern woodland areas.

There is one generation each year in Maine; some writers state that it is occasionally double-brooded. Moths may be present during the summer months, but the eggs are evidently laid early in July, and the caterpillars do much of their feeding during July. Late in July the partially defoliated trees become noticeable although the point of greatest defoliation may not have been reached.

Some of the larvae may pupate as early as the middle of July but many of them cease feeding and pupate in August.

The eggs hatch in about nine days, and the larvae become fully grown in about five weeks, during which time they molt four times. The insect passes the winter in the ground in the pupa stage.

Description

The adult moths have a wing-spread that varies from one and one-half to two inches, the female being slightly larger than the male, and both sexes are olive-gray with rather inconspicuous markings, as shown on Plate 6 a. Generally the male is darker than the female and has less distinct markings.

The first stage larvae have branched dorsal horns or antlers on the first segment, giving the insect the common name of "the antlered prominent" in literature. These horns disappear with the first molt, and there are five distinct larval or molting stages or instars. The full-grown larva is about one and one-half inches long and thickest about mid-way, from which it tapers both forward and backward, the taper being more pronounced distally. The color and markings are extremely variable. Some are light yellowish green, wholly without saddle marks, and others are nearly purple with all intervening variations. Many of the caterpillars have a light bluish green area on the back, that is pointed toward the head, with a dark lavender or purple mark or saddle over the first two pairs of pro-legs. The size and shape of these marks vary tremendously. In fact, there are hardly any two alike. As a rule, these saddle marks are near the center of the body but are slightly nearer the tail than the head. Many of the larvae also have dorsal markings near the tail. The appearance of these larvae is shown on Plates 6 b and 7 a.

The pupa is about three-fourths of an inch in length, naked, and is formed in a cell near the surface of the ground not far from the base of the tree. It is brown in color and resembles the pupae of other moths of the group.

The egg is circular, laid separately on the leaf, and is about the same color as the veins of the beech leaf. We have not had an opportunity to study the egg stage.

Natural Enemies

Many of the caterpillars are undoubtedly eaten by birds such as the woodpeckers, sparrows, warblers, thrushes and blackbirds. As these caterpillars are not hairy, probably they may be eaten by almost all kinds of birds.

They are also devoured by the larger ground beetles, particularly of the genus *Calosoma.* The soldier bugs, especially of the genus *Podisus,* also feed upon them. *Podisus modestus* (Dallas) was observed in Maine as destroying large numbers of caterpillars.

Certain four-winged parasitic or ichneumon flies freely attack and destroy the caterpillars. In Maine,[1] *Amblyteles* (*Ichneumon*) *sublatus* Cresson was reared in great numbers, and was considered to be the most important of all the insect parasites of the saddled prominent. *Scambus* (*Pimpla*) *pedalis* (Cresson) was also obtained from the over-wintering pupae.

In Maine many caterpillars were killed by wilt diseases caused by fungi and bacteria, and hung limp from the trees and fell in heaps upon the ground. In fact the entire infestation was wiped out within a few days.

Artificial Control

On account of the natural enemies soon bringing about a decided check of the saddled prominent, artificial control is seldom practiced or needed. Of course, spraying with lead arsenate, as is practiced in certain forest areas for the control of the gipsy moth, will prevent defoliation. Because of the great expense, owners are not apt to spray woodland areas in cases such as the outbreak of the saddled prominent, where natural control is usually so effective. However, it may be advisable to spray choice woodlands in the northwestern portion of the state to prevent possible defoliation in 1931.

Literature

BAILEY, H. L. Report, Vt. Com. of Agr., 10, 27. 1920.
BEUTENMÜLLER, W. Bull. Am. Mus. Nat. Hist., **10**: 425. 1898.
BRITTON, W. E. Conn. Agr. Exp. Sta., Bull. 211, 343. 1918.
FELT, E. P. Jour. Econ. Ent., **1**: 150. 1908. 23d Report, N. Y. State Ent., 21. 35th Report, N. Y. State Ent., 82.
FERNALD, H. T. Report, Mass. Agr. Exp. Sta., 21, 76. 1909.
FISKE, W. F. and BURGESS, A. F. Jour. Econ. Ent., **3**: 389-394. 1910.
HITCHINGS, E. F. Jour. Econ. Ent., **3**: 146-148. 1910.
JACKSON, C. F. Report, N. H. Agr. Exp. Sta., 19-20, 514. 1908.
JOHANNSEN, O. A. Maine Agr. Exp. Sta., Bull. 177, 22. 1910.
PACKARD, A. S. Bombycine moths, Mem. Nat. Acad. Sci., **7**: 230. 1895.
PATCH, E. M. Maine Agr. Exp. Sta., Bull. 148, 262-263. 1907. Maine Agr. Exp. Sta., Bull. 161, 311-350. 1908.
SANDERSON, E. D. Jour. Econ. Ent., **3**: 210. 1910.
SLINGERLAND, M. V., and CROSBY, C. R. Fruit Insects, 127-128. 1914.

THE CATALPA MEALY BUG IN CONNECTICUT

Pseudococcus comstocki Kuwana

W. E. BRITTON

On September 3, Mr. F. S. Eaton, Superintendent of Trees in New Haven, brought to the Station some catalpa twigs that

[1] Patch, E. M. Maine Agr. Exp. Sta., Bull. 161, 343. 1908.

were badly infested with mealy bugs. The specimens were collected from a few sections of the city where catalpa has been planted as a street tree. Visits were made to some of these localities and infested catalpa trees were observed on Bassett Street, between Newhall Street and Shelton Avenue, on Munson Street between Winchester Avenue and Mansfield Street, on Winter Street and Townsend Street, a block west of Dixwell Avenue, and on Division Street. Every catalpa in this section was infested. No doubt this insect occurs elsewhere on catalpa trees. I am quite certain that I saw the same species three years ago along Broad Street in Stamford, on the umbrella catalpa, *C. bungei,* in a front yard.

This insect appeared to be the catalpa mealy bug, *Pseudococcus comstocki* Kuwana, a species that has been studied by Hough in Virginia,[1] and which may cause considerable injury to catalpa trees unless some attempt is made to control it artificially.

Appearance and Injury

This insect is gregarious and forms gray masses of eggs, immature bugs, females and wax secretion including dirt and debris, clustered in the axils of leaves, stems, and around the margins of wounds. Galls are often formed where intensive feeding occurs. On the leaves the bugs are chiefly on the under surface, where they feed by sucking the sap from the principal veins. A clear, colorless liquid called honey dew is excreted and drips upon the foliage and ground below, forming a coating that resembles varnish. In this a black fungus or sooty mold develops, which appears as if the foliage were covered with soot. A severely infested tree thus presents a very repulsive appearance; many of the coated leaves drop and thus partially defoliate the tree. Plate 8 shows the appearance of infested trees.

Distribution

The catalpa mealy bug has been recorded from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, Ohio, Indiana, Florida, Louisiana and California in the United States. It was originally described from Japan, and it also occurs in China and the Canary Islands. It seems to prefer temperate rather than tropical regions, and outdoor plants rather than those in greenhouses.

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[1] Va. Agr. Exp. Sta., Tech. Bull. 29, 1-27. 1925.

Host Plants

Hough[1] gives a list of some 52 different trees and plants that have been recorded as hosts of the catalpa mealy bug. Of the trees, shrubs and vines listed, the following are grown in Connecticut and may become infested: apple, Boston Ivy, boxwood, California privet, catalpa, cherry, chestnut, dutchman's pipe, elder, *Eleagnus,* elm, *Euonymus alatus,* gooseberry, grape, holly, honeysuckle, horsechestnut, *Hydrangea,* maple, mulberry, osage orange, *Paulownia tomentosa,* peach, persimmon, *Photinia villosa,* plum, poplar, privet, sand pear, weigela, wisteria, and yew. The favorite host plant appears to be catalpa and although it may be found on the others, it is not a pest on any of them in Virginia, except on catalpa, weigela and *Photinia villosa.*

Life History

The winter is passed in the egg stage, the small globular eggs being embedded in conspicuous white or gray masses of wax threads, which give the leafless trees a repulsive appearance. In Virginia there are three generations each season, and the eggs of the second and third generations hatch in from eight to 21 days, depending upon the temperature. Young from the over-wintering eggs appear about 10 days after the catalpa buds open. About 28 days are required during the summer in Virginia for the females to reach maturity. A day or two after hatching the young migrate to the leaves where they feed. The older females often migrate from the leaves to the twigs and branches where they also feed. Except for these two periods of migration, the female mealy bugs move about very little. The males form their cocoons in protected places, during the second nymphal stage, and the adult, having wings, can fly about. However, the males are seldom seen.

Natural Enemies

In Virginia a fungus, *Cordyceps clavulata,* is said to destroy as many as five per cent of the mealy bugs in August and September. Two neuropteroid insects, *Chrysopha rufilabris* Burm. and *Hemerobius stigmaterus* Fitch, have been observed feeding upon the younger stages of this mealy bug in Virginia.

Methods of Control

According to the experience of entomologists in Virginia, all summer sprays were unsatisfactory because they either were not effective in killing the mealy bugs or else they injured the foliage.

[1] Va. Agr. Exp. Sta., Tech. Bull. 29. 1925.

Apparently it is difficult to find an insecticide that will penetrate the egg-masses; hence, summer spraying was not recommended. Possibly some of the newer impregnated oil sprays (one per cent oil, and nicotine sulfate one part in 500 parts water) may prove effective for summer applications. Certain small trees, such as the umbrella catalpa, may be cleaned by going over them with a wire brush followed by water from a hose under high pressure.

Evidently the catalpa mealy bug may best be controlled while the trees are dormant. A spray of lime-sulfur (one part in seven parts water) will kill all of the eggs hit by the spray, but will not penetrate the waxy egg-masses sufficiently to kill the eggs inside. For this purpose an oil spray will probably be more satisfactory than other kinds, because of the penetration of the oil. One of the miscible oils, such as Scalecide or Sunoco spray oil, diluted at the rate of one part in 25 parts water, or a two per cent oil impregnated with nicotine sulfate (one part in 800 parts water) or with pyrethrum extract may prove effective as a dormant spray to kill the eggs. This should be applied in spring just before the buds begin to open. We hope to be able to carry out some tests of this sort during the coming season in Connecticut.

Literature

FELT, E. P. N. Y. State Museum, Bull. 174, 161. 1928.
FERRIS, G. F. Monthly Bull. Cal. Dept. Agr. 16, 339. 1927.
HOUGH, W. S. Va. Agr. Exp. Sta., Tech. Bull. 29, 1-27. 1925. Jour. Econ. Ent., **18**: 823-827. 1925.
KUWANA, S. I. Proc. Calif. Acad. Science, **3**: 52. 1902. Original description.
WEISS, H. B. Jour. N. Y. Ent. Soc., **33**: 237. 1925.

EARLY ENTOMOLOGICAL WORK IN CONNECTICUT

W. E. BRITTON

For a number of years I have been interested in the pioneer work in entomology in Connecticut. This is rather hard to trace, for, as some of you know, in those days it was not customary to place date, locality and the name of the collector on each specimen. Consequently, unless the investigator published papers, little remains to show that he did any entomological work. The more I look into the matter, the more I realize that it is necessary to publish papers that may become a part of the literature of the subject in order to form a record of such work available for future generations. Naturally, the early studies of insects were devoted chiefly to classification and the identification of specimens and description of species.

The first paper of which I have any record dealing with Connecticut insects is entitled: "Characteristics of some previously described North American Coleopterous Insects, and description of others which appear to be new in the collection of Abraham Halsey." It was written by Dr. Thaddeus W. Harris, Librarian of Harvard University, in the Transactions of the Hartford Natural History Society, No. 1, page 65, 1836. In this paper, 27 species were identified or described. It was illustrated with one plate showing 11 species, most of which we can recognize as being more or less common to-day. For the most part, no dates or exact localities were given, though one (*Clytus nobilis*) was recorded from Hartford and another from New Hampshire. Several species are described but some of the names are now synonyms. However, the following appear to have been originally described in this paper:

Lampyris (now *Lucidota*) *decipiens* Harris
Anobium (now *Xyletinus*) *pelatatum* Harris
Clytus (now *Calloides*) *nobilis* Harris
Lamia (now *Liopus*) *fascicularis* Harris

Another species, *Elater militaris* Harris, was apparently described in an earlier paper.

It should be borne in mind that this paper by Harris, who is now known as the father of American economic entomology, was published five years before the Report on the Insects of Massachusetts Injurious to Vegetation (1841) and is now a rare paper. Copies may be found in the Connecticut State Library; the Connecticut Historical Society, Wadsworth Atheneum, Main Street, Hartford; the Library of Congress; the library of the American Entomological Society at the Academy of Natural Sciences, Philadelphia, and I think there is one at the Boston Society of Natural History. Mr. George M. Greene reprinted Harris' paper with comments and without plate in the Transactions of the American Entomological Society, Vol. XLIV, pages 251-261, 1918, so that it is now available to all entomologists.

I have spent considerable time hunting through town histories and records of the period in an attempt to learn something about Abraham Halsey. The Halsey Genealogy was of no help in the matter, and I have not yet ascertained where he lived. However, Mr. C. W. Johnson tells me that Halsey was a member of the Hartford Natural History Society in 1836, and presumably lived in Hartford or vicinity.

I hold in my hand an address on "Injurious Insects" by Noyes Darling, given before the New Haven Horticultural Society and the New Haven County Agricultural Society at their annual fair, New Haven, October 1, 1845. It is a scholarly and interesting paper of 26 printed pages, though the remedies (mostly hand pick-

ing and crushing) are now considered out of date. Darling was graduated from Yale University with the degree of bachelor of arts in 1801, and later received the degree of master of arts. He was a tutor from 1804 to 1808, and fellow ex-officio, 1827-1828. He lived in Woodbridge and represented the town in the General Assembly of 1821, 1822 and 1829, and was a State Senator in 1825, 1826, 1827, 1830 and 1831. About 1830 he moved to New Haven, was elected Mayor in 1833, and served for one year. In 1823 Darling was appointed and served as Assistant Judge and from 1830-1838 as Chief Judge of the County Court; again in 1842 he was appointed to the position of Chief Judge, which he held, except for a brief interval, until his death in 1846. Darling gave much attention to horticulture and injurious insects and many of his communications were printed in agricultural journals, but his only separate publication was the one mentioned above.

Three important pioneers in Connecticut Entomology were Edward Norton, Homer Franklin Bassett and Samuel Wendell Williston.

Edward Norton was born in Albany, N. Y., in 1823, and died in Farmington, Conn., in 1894. For many years he was a farmer and dairyman in Farmington and was Secretary of the American Guernsey Cattle Club. He lived in the gray house recently owned by D. N. Barney. It is the first on the left of the road branching northward from the Farmington-Hartford turnpike on the curve that ascends the hill as you leave Farmington to go toward West Hartford. A red house of the olden time stands on the right-hand corner where this road branches off.

Norton was graduated from Yale University in 1844. He was a specialist in the Hymenoptera, especially the Tenthredinidae, or sawflies, and his entomological work was done between 1860 and 1880. He translated DeSaussures' "Synopsis of American Wasps," read the proof and saw it through the press. It was published in 1875, as Smithsonian Miscellaneous Collections No. 254 and contains 390 pages and four plates.

Norton described some 270 species, about 166 of them being sawflies, and the others wasps, bees and ichneumon flies. Of the 533 species of sawflies and horn-tails listed in the "Hymenoptera of Connecticut," 144, or more than one-fourth, were described by Norton.

Of Norton's types, 125 are in the collections of the American Entomological Society, at the Academy of Natural Sciences, Philadelphia, Pa.; 33 are at the Boston Society of Natural History, and a few are at Peabody Museum of Yale University.

After Norton's death, the remnants of his insect collection were given to Prof. A. E. Verrill and moved to New Haven and placed in Peabody Museum. Many specimens had been destroyed by *Anthrenus,* but some things were saved and are now in the Museum at New Haven.

A list of the Norton types in Philadelphia may be found in the Memoirs of the American Entomological Society, No. 5, pages 84-85, 1928. An obituary notice of Norton with a portrait, is in Entomological News, Vol. V, pages 161-163, 1894.

Homer Franklin Bassett was born in Florida, Mass., in 1826, and died in Waterbury, Conn., in 1902. He studied at Oberlin and Berea (Ohio) Universities, but I think did not graduate. He taught school in the winter for several years and in 1859 opened a private school in Waterbury, Conn. In 1871 he was running an insurance and real estate business, and in 1872 was appointed Librarian of the Bronson Library, a position that he held until 1901. Bassett early became interested in the Hymenopterous gall flies of the family Cynipidae and described about 125 new species, many of them from Connecticut. This work was done during the years between 1860 and 1900.

In Cresson's "Synopsis of North American Hymenoptera," published in 1887, of the 359 species of Cynipidae, 84, or nearly one-fourth, were described by Bassett. The Hymenoptera of Connecticut (1916) contains 76 species of Cynipidae described by Bassett and 50 species described by others.

Nearly all of the Bassett types are in the collection of the American Entomological Society, Philadelphia, Pa. A list of these types of 125 species was published in the Transactions of the American Entomological Society, Vol. XLVIII, pages 197-203, 1923. An obituary notice of Bassett with a portrait was printed in Entomological News, Vol. XIII, pages 203-205, 1902.

Samuel Wendell Williston was born in Boston in 1852 and died in Chicago in 1918. He was graduated from the Kansas State Agricultural College in 1872, and received his doctor of medicine degree in 1880 and his doctor of philosophy degree in 1885, from Yale University. During the '80's he was assistant to Prof. O. C. Marsh, the noted paleontologist. Williston became interested in the Diptera in 1878 and soon began to publish papers. Schiner's Fauna Austriaca had appeared in 1864, and Williston was greatly elated when he found that by using the keys, he could separate his American specimens into their families and genera. Soon Williston prepared keys for the separation of the American species of the Diptera, and these published in pamphlet form in 1888, became the first edition of his "Manual of North American Diptera," one of the most useful entomological works published in the United States. A second and enlarged edition of 167 pages appeared in 1896, and the third, revised and greatly enlarged, which contained 405 pages, in 1908. All editions of this work were published by J. T. Hathaway, a New Haven printer, whose daughter Williston had married. The third or last edition is now out of print and sells for $18 or $20.

In the meantime, the "Synopsis of the North American Syrphidae" was published in 1886, as Bulletin No. 31 of the United States National Museum.

In 1890, Williston became professor of historical geology and paleontology at the University of Kansas, and in 1902 was called to the University of Chicago as professor of paleontology.

As nearly as I can ascertain from an examination of Aldrich's "Catalogue of North American Diptera," Williston described 678 American species and several genera. In fact, he described species in nearly every family, but those families in which he described a considerable number of species are as follows:

Syrphidae	149	Tachinidae	27
Asilidae	106	Ephydridae	27
Bombyliidae	49	Conopidae	26
Stratiomyidae	36	Tabanidae	26
Mycetophilidae	30	Chironomidae	24
Tipulidae	29	Drosophilidae	23

Williston's types are scattered: the Syrphidae are in the United States National Museum; the other earlier collections at the University of Kansas and those described in the Biologia Centrali-Americana and the St. Vincent material are in the British Museum, London. Types of some later collections are in the American Museum of Natural History in New York City.

An obituary notice of Williston, by Dr. J. M. Aldrich, with a portrait, was published in Entomological News, Vol. XXIX, pages 321-327, 1918.

Please note that of these three pioneers, Norton, Bassett and Williston, not one ever held a position as an entomologist. They had other vocations and took up entomology as a hobby or side issue. Yet science in general and entomology in particular, have been greatly enriched on account of their hobbies.

William Hampton Patton was born in Waterbury, Conn., in 1853, and died in Hartford in 1918. He was graduated from Yale University in 1876, and for a time after graduation was assistant in zoology under Prof. A. E. Verrill. From 1879 to 1882 he was assistant in entomology for the United States Entomological Commission, and the United States Department of Agriculture, Washington, D. C. He then became insane, with lucid intervals, and spent the remainder of his life in an asylum.

His entomological papers were of high quality and were published between 1876 and 1909. He described 40 species in the Hymenoptera and at least one in the Diptera. Four of the Patton types are in the collection of the American Entomological Society, Philadelphia, and are listed in Memoirs of the American Entomological Society, No. 5, page 86, 1928. An obituary notice of Patton, by W. E. Britton and L. O. Howard, appears with a portrait in Entomological News, Vol. XXXIII, pages 33-40, 1921.

Soon after the establishment of the office of State Entomologist in Connecticut, several letters were received from Patton. They were perfectly lucid and he pointed out certain minor problems needing investigation. One of the letters, I think, contained keys for separating cutworms. Another mentioned a point in connection with the life history of a certain insect, which he thought he could elucidate if he had $50. I replied that I would be in Hartford the following week and if he would be at a certain place at a given time (which I mentioned) we would talk it over. I was there at the time and place, but he did not appear. I did not know at the time, though Professor Verrill informed me some weeks later, that Patton was an inmate of the Hartford Retreat, at 400 Washington Street. It seems that he was allowed to write and send out letters about insects, but probably my letter never reached him. At any rate, he could not meet anyone outside the grounds.

After Patton's death, his insect collection, which he was allowed to have in the asylum, was found to be in bad condition, and the executor of his estate on advice of someone considered an authority, ordered it destroyed. Although such action may have been perfectly justifiable, some of us would like to have seen it in the hope of finding a few specimens worth saving, or resurrecting a few labels in Patton's handwriting.

Stewart N. Dunning of Hartford, a lawyer now living, in the late '90's published several papers describing at least eleven species of Hymenoptera. Six of Dunning's types are in Philadelphia, and are listed in Memoirs of the American Entomological Society, No. 5, page 80, 1928.

Addison E. Verrill was born in Maine in 1839 and died in California in 1926. He was graduated from Harvard University in 1862 and received his master of arts degree from Yale in 1867. He was an assistant at the Museum of Comparative Zoology, Cambridge, Mass., from 1860 to 1864, and professor of zoology at Yale University from 1864 to 1907, when he was made professor emeritus. In his comprehensive report on the Bermuda Islands, pages 735-828 deal with the insects,[1] in which he described a new genus and species of Psocidae.

Sidney I. Smith, a brother-in-law of Verrill, was born in Maine in 1843 and died in New Haven in 1926. He was graduated from Yale in 1867 and received an honorary master of arts degree in 1887. He was instructor from 1867 to 1875 and professor of comparative anatomy from 1875 to 1906 at Yale, after which he was professor emeritus. In 1871 Smith gave an address at a meeting of the Connecticut Board of Agriculture in which he

[1] Trans. Conn. Acad. Sciences, Part II.

emphasized the importance of studying insects. The following year, 1872, as entomologist to the board, he made a report containing a brief account of the Orthoptera, followed by a list of 61 species recorded from Connecticut. Smith described at least one grasshopper, *Melanoplus mancus,* and a large moth, *Samia columba.*

Both Verrill and Smith in their courses in zoology for years gave more or less instruction about insects.

It may be interesting to note here that E. P. Van Duzee, for many years librarian of the Grosvenor Library, Buffalo, N. Y., and now of the California Academy of Sciences at San Francisco, was once an assistant to Professor Verrill. Van Duzee is one of our leading specialists in the Hemiptera, and the author of "Catalogue of the Hemiptera of America, North of Mexico," a volume of 902 pages. In later years, he has described a number of species from Connecticut.

The series of reports of the Connecticut Board of Agriculture, beginning in 1854, contain a number of notes and addresses concerning insects, references to which may be found in the Report of the Connecticut Agricultural Experiment Station for 1903, pages 273-276.

Benjamin Franklin Koons was born at Sulphur Springs, Ohio, in 1844 and died at Storrs in 1903. He was graduated from Oberlin in 1874, and received his degree of doctor of philosophy from Yale in 1881. He was professor of natural history at the Storrs Agricultural School, which afterwards became the Connecticut Agricultural College, from 1881 until his death, and taught entomology during this period. He was head of the institution from 1883 to 1898. Professor Koons published little but gave an address before the State Board of Agriculture in 1885 on "Insects Injurious to the Apple." (This is also referred to in the Report of this Station for 1903.)

Henry A. Ballou, a graduate of the Massachusetts Agricultural College, class of 1895, and now of Barbadoes, was instructor in entomology at the Connecticut Agricultural College from 1897 to 1901.

Roland Thaxter, who was botanist of the Connecticut Agricultural Experiment Station, 1888-1890, and William C. Sturgis, his successor, 1890-1902, both published notes about insects in the Station reports. Thaxter had a private collection of moths and worked out the life history of several species of Noctuidae. Between 1880 and 1891 he published in the Canadian Entomologist, several articles on the results of his studies and observations.

Undoubtedly there were many amateur collectors of insects in Connecticut during the nineteenth century, and though some of

them were known to me, I shall not attempt to enumerate them. Our information is too fragmentary to warrant it, as I wish to do justice to all. Of course there were many specialists in Washington and other places who occasionally described species of insects from Connecticut, but it would require more time than I am able to spare to make even a hurried survey of them.

Since the beginning of the present century a great deal of entomological work has been done in Connecticut. We have more official entomologists than ever before. Most of these men are economic entomologists; some are employed by the State and others by the Federal government. Entomology is being taught in our colleges and schools more extensively than ever before. Systematic entomology in Connecticut has also made good progress. It is perhaps yet too early to evaluate this more recent work so I will leave it to be done by some other writer in the future. I am happy to believe, however, that a goodly portion of the later workers will leave records and publications to show what they have accomplished.

THE EFFECT OF TREATMENT FOR THE CABBAGE MAGGOT UNDER CONDITIONS OF LIGHT INFESTATION

R. B. Friend

In the course of our experiments in control of the cabbage maggot during the last two years, certain effects on the crop yield have been observed which may be of interest to growers in view of the disinclination of many farmers to treat the crop until the injury by the insect becomes evidenced by the presence of wilted plants. When the plants begin to wilt, it may well be too late to save them from maggot injury, and the almost certain presence of maggots in injurious numbers practically every year in Connecticut makes it imperative that the plants be treated, regardless of the guess of the growers as to the probability of injury. Even if the maggots are not sufficiently abundant to kill any plants, the treatment may result in an increase in crop yield which tends to offset the expense of the operation. The reasons for this are not quite clear, but it may be that the presence of bichloride or monochloride of mercury prevents the amount of insect injury that would retard the growth of the plants but not kill them, and it would presumably lessen the possibility of injury by diseases.

It has been demonstrated by Glasgow and Goyer (1924) that the standard treatment of cabbages with bichloride of mercury checks the common diseases of cabbage seed-beds which occur in the soil. Clayton (1926) has also shown that this chemical may give a partial or complete control of the diseases of cruciferous crops which occur in seed-beds on Long Island. These diseases may be carried to the field by the infected plants. The use of bichloride

of mercury is thus effective against diseases as well as against root-infesting insects. In regard to the use of monochloride of mercury (calomel), it has been shown by Glasgow (1929) that this chemical, when applied either as a dust or in aqueous suspension, is also very promising for control of the diseases and insects injuring cruciferous crops in the seed-bed.

The results given here were obtained during 1929 and 1930 from plots of Copenhagen Market cabbage which were set out rather late. The infestation by maggots was very light both years, due either to the lateness of planting or the scarcity of insects. In 1929 the plants were grown in the Station greenhouse, and in 1930 they were purchased from a commercial grower. They were all vigorous when set out in the field.

In 1929 there were 12 rows of 91 plants each, and in each row every other 10 plants were treated with bichloride of mercury, one ounce in 10 gallons of water. The planting dates were May 3, 4 and 7, and treatments were applied on May 11, 18 and 24. Half of the plot was treated again June 1, but no difference in crop yield or maggot infestation was observed as compared with that half of the plot treated only three times. There were thus 546 treated and the same number of untreated plants. Thirteen of the untreated and two of the treated plants were killed by maggots (*Phorbia brassicae*).

All heads of marketable size were cut July 11, and the treated plants yielded an increase of 21 per cent in number of heads over the untreated plants. The weight per head was about the same, 2.6 pounds for the treated against 2.5 pounds for the untreated, as would be expected in view of the fact that only the large heads were cut. The increase in yield of 21 per cent of total heads due to treatment was significant, as the first heads cut are likely to bring the best price. The total increase in weight of treated over untreated plants was 108 pounds (531 pounds against 423 pounds), and the total number of heads cut from the treated plot was 204 against 169 for the untreated.

On July 18 the remaining heads were all cut, large and small. The treated plants yielded 305 heads weighing 477 pounds, or 1.6 pounds each, and the untreated plants yielded 304 heads weighing 426 pounds, or 1.4 pounds each. The great difference in yield came from the early cutting, which indicates that the treated plants matured more quickly than the untreated. The total yield for both cuttings was 509 heads weighing 1,009.3 pounds from the treated plants, an average of 2.0 pounds each, and 473 heads weighing 850.6 pounds, an average of 1.8 pounds each, from the untreated plants. The treatment yielded a total increase of 19 per cent in weight, and 10 per cent in weight per head, for the season.

In 1930 there were 12 rows of 75 plants per row, and every other row was treated with a monochloride of mercury suspension

in water, one ounce of the monochloride in 10 gallons. There were 450 treated and the same number of untreated plants. The plants were set out May 13, 14 and 16. The plants set out May 13 and 14 were treated May 21, and those set out May 16 were treated May 24. All the treated plants received a second application May 29 and a third June 5. No maggot injury was observed in either treated or untreated plants, probably due to the late planting. The crop was all cut at one time, large and small heads, just as the larger heads started to break. The treated plants yielded 430 heads weighing 1,307.3 pounds or 3.04 pounds per head, and the untreated plants yielded 437 heads weighing 1,212.4 pounds, or an average of 2.77 pounds per head. The increase in weight per head due to treatment was .27 pounds or 10 per cent, and in total yield eight per cent, even though slightly more heads were cut from the untreated plants.

The results given above show that even though the mortality of plants due to maggot injury may be slight or nil, the treatment of plants for maggot may still give an appreciable increase in yield, and this increase will be evident in the earlier maturity of the heads, a factor of importance. Whether or not the treatment in years of light infestation would be profitable depends on local conditions of growing and marketing, but no grower can afford to neglect the treatment in any season, since we have no method at present of predicting the abundance of adult flies.

References Cited

GLASGOW, HUGH, and GOYER, W. O. The mercuric chloride treatment for cabbage maggot control in its relation to the development of seed-bed diseases. Jour. Econ. Ent., **17**: 95-191. 1924.

CLAYTON, E. E. Control of seed-bed diseases of cruciferous crops in Long Island by the mercuric chloride treatment for cabbage maggot. N. Y. State Agr. Exp. Sta., Bull. 537. 1926.

GLASGOW, HUGH. Mercury salts as soil insecticides. Jour. Econ. Ent., **22**: 335-340. 1929.

THE EUROPEAN PINE SHOOT MOTH

R. B. FRIEND

The European pine shoot moth (*Rhyacionia buoliana*) has been present for several years in Connecticut, and although it occurs on a number of species of ornamental pines, in late years it has assumed importance as a pest of red pine plantations (Plates 3, 4 and 5). Early reports of its occurrence in Connecticut have been given by Britton (1930), and a bulletin on the insect has been published by Busck. The insect is also discussed by Friend (1931).

The orthodox method of treating infested pines has been to cut off and destroy the buds and shoots which contain the larvae. Inasmuch as such a procedure mutilates heavily infested young pines, and a spraying procedure might be practicable on small plantations, an attempt was made to control the insect in a small plantation of red pine by spraying with an insecticide, the object being to kill the eggs. Smith, Fisher, and Guyton (1930) had considerable success in controlling a related native species, *Rhyacionia frustrana,* by applying a light miscible oil to the trees during the egg stage of the insect.

The plantation of red pines, situated in Hamden, covered about an acre and the trees were two to four feet high. Prior to spraying, the infestation ran as high as 70 to 90 per cent of the tips. The southern end of the plantation was more heavily infested than the northern end. Adults began to fly abundantly June 13, 1930, and the flight continued until the first part of July. The trees were sprayed by Mr. Zappe and Mr. Stoddard of this Station, and the writer June 21, 1930, and June 30, 1930.

The plantation was divided into four sections, the southern section being treated with a two per cent Volck emulsion, the south central section with a two per cent Verdol emulsion, and the north central section with nicotine sulfate, 1-400, in a one per cent Penetrol mixture. The northern section remained untreated as a check plot. The second spray was a repetition of the first. Although the primary purpose of spraying was to kill eggs, many adults, which are found resting in the trees during the day, were also killed.

On August 28, 1930, a count was made of infested tips of the two top whorls of branches in order to determine the effect of spraying. Larvae were present in the buds and tips at this time. The results are given below.

EUROPEAN PINE SHOOT MOTH CONTROL

Insecticide	Infested tips	Uninfested tips	Total tips	Per cent infested
Volck, 2%	127	207	334	38
Verdol, 2%	198	154	352	56
Nicotine sulfate and Penetrol	139	175	314	44
Check	309	100	409	76

In view of the fact that the sprayed plots were more heavily infested before spraying than the check plot, the results are significant. It is our opinion that a third spray a week or 10 days later would have given better results. Although no foliage injury due to the oil sprays could be detected in this instance, there is a possibility of too much oil causing injury, and it would probably be better to use the nicotine-Penetrol combination when three sprays are applied.

References Cited

BRITTON, W. E. Twenty-Sixth Report of the State Entomologist of Connecticut. Conn. Agr. Exp. Sta., Bull. 285, 277-278. 1927.

BRITTON, W. E. Twenty-ninth Report of the State Entomologist of Connecticut. Conn. Agr. Exp. Sta., Bull. 315, 495. 1930.

BUSCK, A. The European pine-shoot moth; a serious menace to pine timber in America. U. S. Dept. Agr., Bull. 170. 1915.

FRIEND, R. B. The European pine shoot moth in red pine plantations. Jour. For., **29**: 551-556. 1931.

SMITH, FISHER, and GUYTON. A preliminary report of the control of the pine tip moth, *Rhyacionia frustrana* Comstock. Jour. Econ. Ent., **23**: 113-118. 1930.

AN ELECTRIC STERILIZER FOR KILLING INSECTS IN MILLED CEREALS

PHILIP GARMAN

During the fall of 1930 our attention was called to a machine for killing insects in sealed packages. The instrument is designed to kill insects of various stages in milled cereals without harming the packages or their contents. It will treat 45 to 90 fourteen ounce cartons of cereal per minute; the actual time for passage of a single package varies from 25 seconds for Farina or similar material to two minutes for flour. Packages up to about four inches in thickness may be treated.

On February 16, 1931, small tests were made with the following insects in cardboard packages containing finely-ground Farina: *Plodia interpunctella* Hbn., larvae; *Tribolium confusum* Jacq., adult beetles; *Silvanus surinamensis* Linn., adult beetles, and the larvae of *Lasioderma serricorne* Fabr. All of the insects were killed by the treatment and the package unharmed, being only slightly warm on removal from the machine. According to the manufacturer, the instrument does not kill insects inside whole grain, but kills those present in milled cereals. The treatment is said to penetrate any type of package except those wrapped in tinfoil or other metal.

The electrical specifications furnished by the company are given below. Plate 9 shows the general appearance and construction of the apparatus.

The disruptive sterilizer was developed to fill a specific need of the food industry. Its purpose is to treat sealed cartons of milled cereal with high voltage, high frequency corona. This destroys insect life in all of its four stages of egg, larva, pupa, or adult, and thus prevents any further propagation. This is done by passing the cartons over an endless belt and under several electrodes rotating in a plane parallel with the belt. The electrodes emit corona which is concentrated vertically downwards towards the belt by neon tubes underneath it. In passing through the cartons the corona current selects the paths of least resistance and highest permittivity, and the insects, fulfilling both of these conditions, act as points of concentration of

current, as well as dielectric flux. It is apparent that the boxes must not contain any metal foil or metal paint.

The corona passing through the cereal does not appreciably heat it, or change its moisture content, flavor, appearance, or food value.

The frequency employed in the process of sterilization may vary between 600 and 1,000 cycles, and the voltage between 100 and 180 kilovolts, depending on the size of carton and type of cereal treated.

The sterilizer in operation at the present time is run at 640 cycles and 120 kilovolts, and employs direct current as a primary source of power.

An installation using alternating current at the source is employed. In this installation a 3-phase, 5-horsepower, 60-cycle induction motor runs a 720-cycle, 220-volt, 2.5 Kv.A. alternator. The voltage from the alternator is impressed on a 720-cycle, 250-volt to 150-kilovolt gas insulated transformer. A filter circuit consisting of two inductance coils and a small permittor is interposed between the alternator and the transformer. This combination of two series inductances and a shunt capacity partly eliminates the higher harmonics generated at the alternator, giving approximately a sine wave voltage at the transformer primary. It also protects the transformer from surges originating at the motor-generator end and checks the rush of current in case of partial or complete short circuit at the load end.

Because of its distributed capacity, the transformer takes a heavy leading current, a current above the rating of the alternator. An induction coil is therefore placed across the primary; it is in resonance with the equivalent capacity of the transformer at a frequency somewhat lower than 720 cycles, which gives a net power factor of about 96 per cent leading at the operating frequency.

A special feature of this installation is the inclusion of two transformers, one operating at 720 cycles, and the other at 60 cycles in the same casing. The 720-cycle transformer is the one already mentioned, the other, an insulating transformer, is used to run the electrode motors. Its primary is near ground potential, while its secondary is 120 kilovolts above ground and is insulated for that voltage from the primary. The secondary operates the electrode motors at 110 volts; thus the motors, as well as the electrodes, are 120 kilovolts above ground potential.

The electrical equipment underneath the belt consists of pyrex plates, neon tubes, and ground condensers. The pyrex plates act as condensers between the belt and the neon tubes, and help to prevent sparkover to the tubes. The neon tubes are equivalent to a very high resistance, while aluminum plates serve as small condensers to ground.

Hence, a current of approximately 10 milliamperes flows from the electrodes through the cereal cartons as corona, through the belt and pyrex glass as a capacity charging current, then through the neon tubes by ionization, and finally through the ground condensers, as well as the surrounding frame and floor capacity to ground.

The sterilizer is completely enclosed by a grounded steel and iron frame and a mercury switch automatically shuts off the power in case the frame door is accidentally opened during operation. The complete machine is about 13 feet long, 4.5 feet wide, and 8.5 feet high. It weighs about 3,000 pounds and the power consumption is between 3.5 and 5 kilowatts.

SPREAD OF THE SATIN MOTH

Stilpnotia salicis Linn.

W. E. Britton

The satin moth has continued to spread westward in Connecticut during the past few years. Quarantine Order No. 19,

effective March 15, 1929, placed under quarantine all towns east of the Connecticut River and the towns of Hartford and Suffield west of the river.

On June 16 and 18, specimens were received from Waterbury, and on June 18, Dr. Friend and Mr. Zappe visited the infested locality. They found quite a large section, a square mile or more in extent, in the northeastern portion of the city, where the poplar trees were infested. The poplar trees around the Polish church on East Farms Street were entirely defoliated.

During July, four gipsy moth scouts were sent into towns bordering on the quarantined area to ascertain the spread of the satin moth. State scouts examined 32 towns and found infestations in four, as follows: New Britain, Newington and West Hartford in Hartford County and Old Saybrook in Middlesex County.

Federal scouts examined the towns farther westward and found infestations in Branford, New Haven, Hamden, Milford and Naugatuck in New Haven County.

These infestations were nearly all on poplar, and in only one case was the insect found on willow by the state scouts. It will soon be necessary to extend the quarantine to include this infested territory. This insect is shown on Plate 14.

THE JAPANESE BEETLE IN CONNECTICUT IN 1930

W. E. Britton and J. P. Johnson

Control of the Japanese beetle has been carried on in coöperation with the United States Plant Quarantine and Control Administration, and we hereby express our appreciation and thanks to Mr. C. H. Hadley for many favors.

Scouting for Beetles

This work began on July 1, and was completed on August 30. It started with 16 men and on July 7, 19 more men were added, and two supervisors assigned from the regular force, which made 37 altogether. At first the men were given instructions illustrated by lantern slides on the life history and habits of the Japanese beetle. They were then placed for a few days in Bridgeport where beetles were present, divided into crews of four men each and shown by the supervisors how to conduct the scouting work. Each crew was then assigned to a definite territory, on the completion of which the men were moved to another area by the supervisor.

At first the larger cities were covered, and afterward scouting was done in many villages as well as along some of the main highways connecting them. The scouts also examined the grounds

of all classified florist and nursery establishments (137) in the state, but no beetles were found.

The areas scouted during the beetle season of 1930, include the following cities and villages:

Avon
Berlin
Bethel
Bloomfield
Branford
Bristol
Bridgeport
Brooklyn
Canaan
Centerbrook
Central Village
Cheshire
Clinton
Colchester
Collinsville
Cromwell
Danbury
Danielson
Deep River
East Berlin
East Haddam
East Hampton
East Hartford
Enfield
Essex
Fairfield
Falls Village
Farmington
Forestville
Glastonbury
Goshen
Groton
Guilford
Hartford
Jewett City
Kensington
Lakeville
Litchfield
Lyme
Madison
Manchester
Meriden
Middletown
Milldale
Moodus
Moosup
Mystic
Naugatuck
New Britain
New London
New Milford
Newtown
Niantic
Norfolk
Norwich
Norwichtown
Old Saybrook
Pawcatuck
Plainfield
Plainville
Plantsville
Plymouth
Pomfret
Portland
Putnam
Ridgefield
Rockville
Rocky Hill
Simsbury
Southington
South Manchester
South Windsor
Stafford Springs
Stonington
Stratford
Suffield
Terryville
Thomaston
Thompsonville
Torrington
Uncasville
Unionville
Wallingford
Warehouse Point
Waterbury
Watertown
Wauregan
West Hartford
Westbrook
Wethersfield
Willimantic
Willington
Windsor
Windsor Locks
Winsted
Woodbury
Woodstock

New Infestations Discovered

The Japanese beetle was found for the first time in six cities and towns in the following numbers: Branford, 118; Danbury, 31; Enfield, three; Groton, one; Meriden, two, and Terryville, one. Some of these beetles were caught in the baited traps placed in these towns to attract them. The last beetle found during the season was at Terryville, September 10.

Beetles Collected Around Old Infestations

Traps were placed in Hartford, New London and Willimantic, where in 1929 infestations were known to exist. Scouts examined these traps regularly, and gathered and recorded the number found in them, as well as those found in the vicinity outside the traps. The number of beetles collected and killed was as follows: Hartford, 3,095; New London, 220, and Willimantic, 17, which made a

total of 3,332. No attempt was made to collect beetles in the Stamford-Bridgeport-New Haven quarantined area. The first beetle seen was in Bridgeport on July 1.

Quarantine Enforcement

Federal Quarantine No. 48 was revised, effective March 1, 1930. This quarantine extended the regulations over the entire State of Connecticut, Hampden County, Mass., and Dutchess County, N. Y., adjoining Connecticut. It subdivided the quarantined territory into two zones or areas, known as the generally infested, and the lightly infested, areas. In Connecticut the area formerly quarantined in Fairfield and New Haven Counties, shown in Figure 52 of Bulletin 315 of this Station, comprised the generally infested area, and the remaining portion of the State formed the lightly infested area. No change was made in 1930 in the state quarantine concerning the Japanese beetle.

Inspection and Certification of Farm Products

Farm products were inspected by each of the three following methods: (1) platform inspection in the larger cities; (2) farm inspection where the products were grown, and (3) inspection of roadside stands.

Platform inspection was maintained in the market sections of New Haven, Bridgeport, Norwalk, Stamford and Shelton, and all requests for inspections within these areas were referred to these inspection points. The inspection was started on June 15 at the New Haven platform and between July 1 and October 1, a 24-hour service was maintained except from 6:00 P. M. Saturday until 4:00 P. M. Sunday, when the market was closed. Part-time service was maintained at the other platforms in such a manner as to give the greatest possible convenience to shippers. Certificates were issued to accompany the shipments.

In this inspection work mentioned above, 16 men were employed, three foremen and 13 inspectors. The only infestations were in corn at Bridgeport, where four beetles were found. The number of packages certified at each of the inspection platforms is shown in the following table:

INSPECTIONS AT PLATFORMS

Place	Number men	Packages certified	Beetles removed
Bridgeport	4	55,894	4
New Haven	9	390,948	0
Norwalk	1	20,364	0
Stamford	1	1,145	0
Shelton	1	734	0
Total	16	469,085	4

Products were inspected while growing in the fields on certain farms; when the inspector was satisfied that infestation would probably not occur, blanket certificates good for one month were issued.

Roadside stand products were certified only on condition that they were grown at certified farms or could be inspected before being placed upon the stands ready for sale.

CLASSIFICATION OF FARM PRODUCTS INSPECTED

Number of packages certified

Articles	Bridgeport	New Haven	Norwalk	Stamford	Shelton	Total
Corn	473	19,799	407	6	1	11,686
Beans	1,350	21,485	604	50	0	23,489
Peas	1,444	7,778	471	35	8	9,736
Lettuce	2,027	28,311	962	69	476	31,845
Vegetables with tops	9,779	29,089	4,711	234	26	43,839
Miscellaneous vegetables	13,115	20,818	5,272	391	159	139,755
Miscellaneous fruit	20,709	145,162	6,330	214	24	178,439
Bunches bananas	997	27,506	1,607	145	40	30,296
Boxes cut flowers	127	554	16	48	2,032	2,777
Total	56,021	391,502	20,380	1,193	2,776	471,862

At Shelton, 89 bales of hay and 11 bales of straw were inspected and certified for shipment. Altogether, 626 carloads of sand and soil and 54.5 carloads of manure were certified for shipment.

Nursery and floral stock was certified for shipment to every state in the Union except New Jersey, which is in the infested area where certificates are not needed, the District of Columbia, and foreign countries. Altogether, 39,126 certificates were issued on nursery and floral stock. These covered 6,350,220 plants, of which 89,310 were contained in shipments consigned to foreign countries; 135,229 were shipped from the generally infested area in Connecticut to the lightly infested area in Connecticut.

TOTAL NUMBER OF CERTIFICATES ISSUED

Farm products	Cut flowers	Hay and straw	Nursery and floral stock	Sand and soil	Manure	Total
22,597	2,777	9	39,126	1,012	32	65,553

Road Patrol Inspection

Altogether, 80 roads were posted with quarantine signs, 66 leading out of the generally infested area and 14 out of the lightly infested area. Ten roads were guarded by patrolmen in uniform eight hours each day, but on five roads a 24-hour service was maintained between July 1 and August 24. For the road patrol work,

altogether, 24 men were employed. The number of vehicles carrying quarantined articles without certificates and the number of vehicles from which quarantined articles were intercepted are shown in the following table:

VEHICLES CARRYING CONTRABAND ARTICLES

	Wilton-Ridgefield	Easton-Bethel	Seymour-Waterbury	Woodbridge-Bethany	Cheshire-Waterbury	North Haven Wallingford
Quarantined articles without certificates	16	0	89	282	110	248
Quarantined articles certified	490	132	956	426	1,022	2,045
Total	506	132	1,045	708	1,132	2,293

	Northford-Middletown	East Haven-Branford	Stonington-Westerly, R.I.	Danielson	Total
Quarantined articles without certificates	412	461	50	8	1,676
Quarantined articles certified	261	3,709	23	16	9,080
Total	673	4,170	73	24	10,756

One truck driver was prosecuted August 15, 1930, for violating the Japanese beetle quarantine. He was fined $20 and costs amounting altogether to $43.40 for carrying uncertified farm products from points inside the generally infested area to a point outside that area within the state.

Soil Treatment

In 1930 it was necessary on two occasions to treat potting soil near Japanese beetle infestations, where it was desired to move the soil from the open into the greenhouse. Carbon disulfide was used in both cases.

The first treatment was given on October 7, 1930, in a tight wooden bin measuring 12 by 9 by 3 feet, in which 12 cubic yards of soil were fumigated. Adjacent to this bin was another bin measuring 12 by 3 by 3 feet, in which four cubic yards of manure were treated at the same time. The soil was thrown loosely into the bin, and the carbon disulfide was distributed as uniformly as possible in holes about 12 inches apart and 12 and 18 inches deep; the material was used at the rate of one pound to one cubic yard of soil. As soon as the liquid was applied the holes were filled with soil and the top covered with a heavy ruberoid paper and left undisturbed for 48 hours, after which the contents were removed and aired and then stored in a tight garage adjacent to the greenhouse.

The second treatment was given in the same bin on November 3, when 16 cubic yards of soil were treated in the same manner as has been described.

Lawn areas in Hartford. New London and Willimantic were treated with an application of lead arsenate, one part; tankage, two parts; and sand, four parts. The mixture was applied at the rate of 1,500 pounds per acre. Altogether, 65 tons of this material were used. It was furnished, mixed and carted by the Federal employees, and a certain proportion of the cost was borne by the state. Following the recommendations of the United States Bureau of Entomology, only one-third of the entire amount per acre was applied. The remainder was to be used in two later treatments.

In Hartford, treatment was given to several areas totaling about 85.5 acres. These were situated in several different sections of the city, as follows: Bushnell Park, a portion of the grounds around the Capitol, State Library and State Armory; grounds of Hartford Fire Insurance Company and vicinity, north of Asylum Street, between Spring and Sigourney Streets; between Farmington and Capitol Avenues near Prospect Avenue; between Broad Street and Fairfield Avenue south of New Britain Avenue; and in the south part of the city west of Wethersfield Avenue.

In New London, about 15 tons were applied to about 19.5 acres, June 16-21. The section treated was between Broad, Hemstead, Huntington and Richards Streets.

In Willimantic, June 5-7, about 6.9 tons were applied to about 9.2 acres between Valley and Prospect Streets from Jackson to South Maple Street.

THE ASIATIC BEETLE IN CONNECTICUT IN 1930

W. E. Britton

The Asiatic beetle, *Anomala orientalis* Waterhouse, has continued to injure lawns in the Westville section of New Haven. Although on account of the drought in 1930, the grubs descended several inches beneath the surface and did not cause the usual amount of injury to the grass, some injury was apparent late in the season. On lawns that were watered frequently, the normal amount of feeding occurred, except where lead arsenate had been applied to prevent injury. Many property owners have treated their lawns with lead arsenate. Three properties in New Haven, one in West Haven and one in Bridgeport, were treated with lead arsenate by our men as demonstrations in the method of application or in control.

A neighborhood demonstration of the proper method of applying lead arsenate to lawns was given by Dr. Friend and Mr. McFarland on an infested property on Glen Road, May 16. This demon-

stration was requested by the Beaver Hills Association because of several infested properties in that vicinity, and about six property owners were present.

Quarantine

Federal Quarantine No. 66, concerning the Asiatic beetle, was abolished or repealed March 30, 1930. The state quarantine, however, has remained in force. As certain infestations were discovered just outside the border of the quarantined area on the northeastern corner of the New Haven infestation, it seemed necessary to extend the area to include these infestations. Consequently the following quarantine order was issued, effective April 15, 1930:

STATE OF CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN.

Quarantine Order No. 25.

CONCERNING THE ASIATIC BEETLE

Federal quarantine No. 66 concerning the Asiatic beetle, *Anomala orientalis*, having been revoked March 1, 1930, it seems advisable to revise State Quarantine No. 22, effective April 1, 1929, especially as regards the regulated areas.

Now, therefore, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, under authority conferred by Chapter 31, Public Acts of 1927, as amended by Chapter 171, Public Acts of 1929, do hereby proclaim the following areas in the towns of New Haven and West Haven subject to the restrictive regulations of this quarantine.

Westville area. Bounded by Whalley Avenue, Blake Street, Fitch Street, Dyer Street, Crescent Street, Carmel Street, Whalley Avenue, Ellsworth Avenue, Derby Avenue, Boulevard, Oak Street, Forest Road, Florence Avenue from a point about 400 feet west of Forest Road, in a straight line northward to West Prospect Street to Whalley Avenue, and all territory within these boundaries, being partly in New Haven and partly in West Haven.

West Haven area. Bounded by Center Street, New Haven Harbor, Jones Street and in a straight line to Atwater Street and Campbell Avenue.

The movement of all quarantined articles designated below is restricted from any point within the areas designated above to other portions of the towns of New Haven and West Haven or to points outside thereof.

Until further notice the movement of certain articles and materials as designated below will not be permitted except where inspection or treatment is practicable and permits are issued by duly authorized agents of the Agricultural Experiment Station.

The articles and materials restricted are as follows:

During the entire year:

1. Sand, soil, earth, peat, compost and manure.
2. Nursery, ornamental and greenhouse stock, and all other plants.
3. Turf or sod trimmings, lawn or shrub clippings, ground litter, and weeds.

For the period from June 20 to August 15:

1. Cut flowers.
2. Hay (freshly cut).

All territory within the towns of New Haven and West Haven not included within the regulated areas described above, are hereby removed from the restrictions placed by State Quarantine Order No. 22, that took effect April 1, 1929.

This order shall take effect on and after April 15, 1930.

WILLIAM L. SLATE,
Director.

Approved:

JOHN H. TRUMBULL,
Governor.

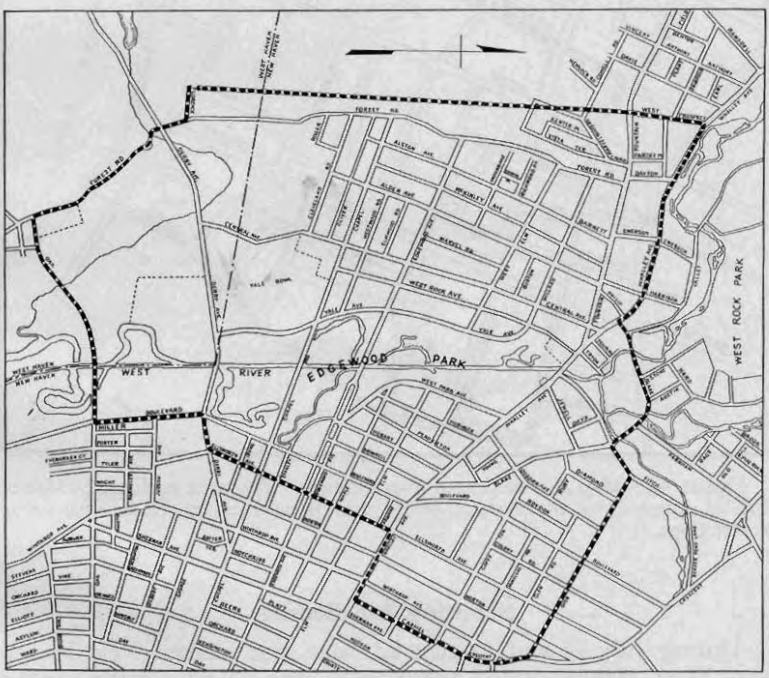


FIGURE 43. Map of the Westville section of New Haven. The area enclosed by dotted line is infested by the Asiatic beetle and is now under State quarantine restrictions.

The foregoing quarantine order changes only the New Haven quarantined area by extending it to include the area between

Moreland Road and Dyer Street, from Fitch Street to Crescent Street, and Ellsworth Avenue and Crescent and Carmel Streets north of Whalley Avenue. The West Haven area was extended southward from Brown Street to Atwater and Jones Street between Campbell Avenue and the New Haven Harbor. The present quarantined areas in New Haven and West Haven are shown in Figures 43 and 44.

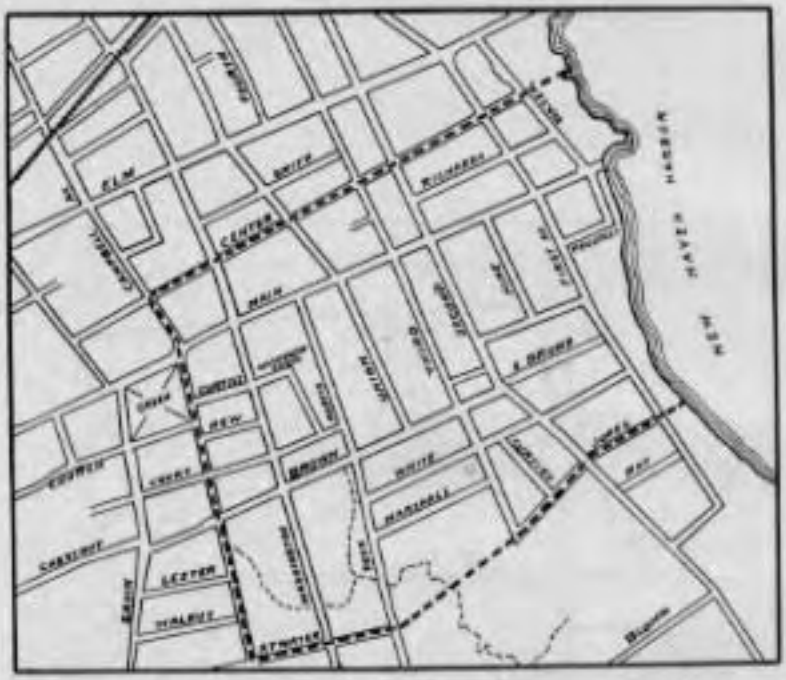


FIGURE 44. Map of a section of West Haven. The area enclosed by dotted line is infested by the Asiatic beetle and is now under State quarantine restrictions.

Scouting for Beetles

During July 14 and August 22, four men scouted New Haven and West Haven, and a record was kept of all Asiatic beetles found. Altogether, 144 beetles were found, most of which were within the quarantined area, but two were found at 372-374 Sherman Avenue, two at 91 Carmel Street, and one at 92 Mansfield Street in New Haven, all of which were outside the quarantined area. None were found outside the quarantined area in West Haven.

Soil Treatment

Dr. Friend is now growing on the Station grounds 11 common kinds of lawn grasses in 66 plots. Some are untreated and others are treated with different kinds and varying quantities of lead arsenate. The infestation on Ford Place, Bridgeport, was treated with lead arsenate on July 28. The area treated contained about 3,100 square feet, and 93 pounds of lead arsenate were used.

A small infested area at 685 Orange Street, New Haven, was treated in 1929. The yard was visited several times in 1930, and no beetles found.

Inspection and Certification

During the year a number of lawns have been examined at the request of owners who suspected the Asiatic beetles to be responsible for the poor condition of their lawns. In a portion of these cases no grubs or beetles were found and the condition had to be attributed to other causes. Most of these examinations were made by Mr. McFarland; 26 were made in New Haven, six in West Haven, and three in Branford.

Mr. McFarland has made the necessary inspections in the quarantined areas and issued the certificates, three kinds being used. The package certificates were issued to accompany living Christmas trees, greenhouse and seedling garden plants sold or shipped from the quarantined area. The soil certificates covered 879 loads, or about 4,395 cubic yards, of soil, gravel, sand, and so forth, used for filling. The certificates on cut flowers and nursery stock covered 354 iris and lily roots, 608 flowering plants, 83 ornamental shrubs, 754 rose bushes and other nursery stock, and 15 bouquets of cut flowers, a total of 1,814 plants. The number of certificates issued for each class was as follows:

CERTIFICATES ISSUED

Kind of certificates	Number certificates
Package certificates	2,515
Soil and gravel certificates	35
Cut flowers and nursery plants	24
Total	2,574

MEASURES FOR THE CONTROL OF THE EUROPEAN CORN BORER

W. E. BRITTON and M. P. ZAPPE

During the summer of 1929 there was a general westward spread of the European corn borer, and all towns not known to be infested were scouted by Federal men. As a result of this

scouting, 44 additional towns were found to be infested. For the most part these were connected with the large, two-generation quarantined area. Four of these newly-infested towns are in the northern and northwestern portions of the state and are connected with adjoining areas in Massachusetts and New York which had already been placed under quarantine on account of the one-generation corn borer.

Nine of the towns where infestations were discovered were not connected with either of these areas, and it was deemed advisable to conduct clean-up measures in these nine towns instead of quarantining them. This work was done by this Department in coöperation with the Plant Quarantine and Control Administration of the United States Department of Agriculture, and the towns referred to are: Bethel, Danbury, Easton, Milford, North Haven, Orange, Roxbury, Southbury and Stratford. With the exception of Milford and Stratford, the infestations were few and widely scattered and the clean-up operations not very expensive.

In Milford and Orange, the growers promised to help in the clean-up work by the early and thorough plowing of their corn fields. Hence the burning work in these towns was confined to the margins of the fields and the rocky places therein, to destroy the weeds and cornstalks that could not readily and satisfactorily be covered in plowing. The results were not entirely satisfactory. Some growers did not plow their land soon enough after the burning operations had cleared their fence rows and field margins of cornstalks, weeds and other plant material. The fields not having been plowed, strong winds blew some of the broken stalks into the fence rows, and such material was not disposed of in a satisfactory manner so far as the control of the corn borer is concerned. In some cases the cornstalks were not plowed under early enough to prevent the moths from emerging. In Milford and Orange, 12 days were required to complete the burning work, and about 14,020 gallons of furnace oil were used. See Plate 10 b.

In the other seven towns, all plant materials subject to infestation by the borer, both in and around the infested fields, were burned or immediately plowed under by Federal employees or persons directed by them.

In the town of Stratford there were two infestations in a rather thickly populated section. Though these infestations were discovered in backyard gardens, vegetable growers had considerable sweet corn in nearby fields. All cornstalks and weeds in this section of the town were burned, the work taking five days and 8,495 gallons of oil.

In Easton there was only one small infestation in a field of sweet corn. The stalks in this field and the stubble and weeds in adjoining fields were all burned in two days, using about 1,545 gallons of oil. In one field of about two acres, only the material around the margins and along the fence rows was burned, and the owner

plowed the field under our supervision, all cornstalks having been put into a silo.

In Bethel only one infestation was found in a field of sweet corn. The owner grows other vegetables and sells them at a roadside stand. Consequently there was much other material, chiefly weeds, to be burned. This required two days and 955 gallons of oil.

In Danbury there was only one infestation, and that in corn. Several garden plots and the margins of several large fields in the vicinity were burned over. These fields, approximating 9.5 acres, were then plowed by Federal men.

In Southbury there were two infestations: One was in a large garden plot which was burned over in a portion of a day; the other was on a large dairy farm having many large fields of corn stubble and weeds. At the latter infestation, burning was done only along the field margins and fence rows, and required about two days of time. At both infestations about 1,700 gallons of oil were used. Federal employees plowed about seven acres of corn stubble, and the remainder was plowed by the owners.

In Roxbury only one small infestation was discovered and that in a field of sweet corn. The stalks from this field had been cut and thrown into an adjoining pasture and had to be raked into piles and burned. This clean-up required one day's time and 505 gallons of oil.

In North Haven two infestations were found in a market gardening section near Montowese. Both infestations were in sweet corn, near together, and were treated as one. All material suspected of being infested was burned in two days, using 1,985 gallons of oil.

The clean-up work described above was commenced on March 4 and finished April 5. The control equipment consisted of two 600-gallon tank burners and 18 men were in the crew. In Milford and Stratford where the fire hazard was greater than elsewhere, an extra burning truck with tank filled with water was kept in readiness to extinguish fires in case of necessity.

The total amount of oil used in all the nine towns was 30,100 gallons and approximately 200 acres were burned over. About 18 acres were plowed by Federal men and 12 acres plowed by the owners under our supervision. During the scouting season of 1930, the towns of Bethel, Easton, Roxbury and Southbury were not found infested, but borers were discovered in Danbury, Milford, North Haven, Orange and Stratford.

The cost to the state of this work, which is one-half of the total cost, was approximately as follows:

Labor and expenses	$1,189.39
Oil	1,121.40
Total	$2,310.79

Enforcing the Compulsory Clean-up Law and Regulations

The General Assembly of 1929 enacted a measure to compel owners and growers to dispose of cornstalks and other infested material in such manner as to aid in the control of the European corn borer, thus making it possible to grow corn at a profit in an infested region. This law was passed as Chapter 171, Public Acts of 1929, but may now be cited as Section 2125 of the General Statutes (Revision of 1930), and is as follows:

SECTION 2125. The director of the Connecticut Agricultural Experiment Station shall issue and publish orders, rules and regulations which shall be effective in any town or portion thereof which shall have been quarantined on account of the European corn borer as provided by chapter 31 of the public acts of 1927, which orders, rules and regulations may require that each owner, tenant or manager of land on which corn of any kind has been grown shall, not later than December first of the year of its growth, plow or cause to be plowed the field in which it was grown, so as to bury the stubble to a depth of at least six inches, or pull up and destroy such stubble or cause it to be pulled up and destroyed by burning, and each person having in his possession cornstalks shall, not later than April tenth of the year following that of their growth, completely dispose of such cornstalks by using them as fodder or by burning them, and shall destroy, or cause to be destroyed, on or before April tenth of each year, all weeds in such areas as may be designated by the director of the Connecticut Agricultural Experiment Station.

SEC. 2. Any person who shall violate any provision of this act or any order, rule or regulation issued by authority of any such provision shall be fined not more than one hundred dollars.

Approved June 3, 1929.

This law provides that the Director of this Station shall issue orders for the destruction or proper disposal of all cornstalks or stubble before April 10 of each year, in towns that have been placed under quarantine. This law was given considerable publicity in the winter and spring of 1930, so that most of the people to whom it might apply knew of its existence. Similar laws are in effect in Massachusetts and Rhode Island.

A clean-up order was issued, effective January 15, as follows:

STATE OF CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN.

CLEAN-UP ORDER

Pursuant to the provisions of Chapter 171, Public Acts of 1929, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, do hereby issue orders, rules and regulations as follows: That in the quarantined area all cornstalks shall be disposed of on or before April 10, by feeding to live stock, burning or plowing under cleanly, and that all of the larger weeds in and around the cornfields be likewise destroyed.

Effective January 15, 1930.

WILLIAM L. SLATE,
Director.

On April 14, four days after all corn and weeds should have been plowed under, according to the law, seven inspectors were sent into the quarantined towns to ascertain how well the work had been done. Each inspector drove about through the territory assigned to him, looking for cornstalks, corn stubble and weed areas. Nine or 10 towns were assigned to each inspector. When the inspectors discovered cornfields that had not been plowed, they sought the owner to learn why he had not complied with the order. A further order was issued by the inspector, in the form of a blank card filled out to cover the case, giving full directions to carry out certain measures, such as plowing or burning before a given date. Several days were usually allowed for the work. The owner was asked to sign this form as an agreement, and to sign and return to the Station the detached portion thereof as soon as he had complied with the order.

The inspectors were engaged in this work for about two weeks. They found many fields still unplowed, and in many cases the owners claimed that the land was still too wet and muddy to plow, but agreed to plow it as soon as it was possible to do so. Altogether, 72 towns were visited by the inspectors and 749 cards were issued. Of this number, 685 cards were returned to the office, stating that the work had been completed within the time specified in the order.

Quarantine

On account of the marked spread of the European corn borer in 1929, when 44 new towns were found to be infested, it became necessary to revise the quarantine areas to include some of these towns. After due notice and a public hearing at the Station January 7, 1930, the following quarantine order was issued, effective January 15, 1930. This is in accord with Federal Quarantine No. 43, as revised and effective, December 16, 1929.

STATE OF CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN.

Quarantine Order No. 24

CONCERNING THE EUROPEAN CORN BORER

The fact has been determined that the European corn borer, *Pyrausta nubilalis* Hubn., has spread to such an extent as to make it necessary to extend the area restricted by State Quarantine Order No. 21, effective March 15, 1929, and likewise to bring it into conformity with Federal Quarantine No. 43, as revised, effective December 16, 1929. A public hearing was held at the Connecticut Agricultural Experiment Station, New Haven, on Tuesday, January 7, 1930, at 2 o'clock P.M., as provided in Chapter 31, Public Acts of 1927.

Now, therefore, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, under authority granted by Chapter 31, Public Acts of 1927, do hereby proclaim the following areas (including towns affected by Quarantine Order No. 21) to be under quarantine and subject to the restrictions and regulations made a part of Federal Quarantine No. 43, as revised and effective December 16, 1929.

Regulated Areas

Two-generation area—All towns, boroughs and cities in Middlesex, New London and Windham Counties; Berlin, Glastonbury, Manchester and Marlborough in Hartford County; Branford, Guilford, Madison and Meriden in New Haven County; Andover, Bolton, Columbia, Coventry, Hebron, Mansfield, Tolland and Willington in Tolland County.

One-generation area—The towns of Enfield and Suffield in Hartford County; Somers in Tolland County; North Canaan and Salisbury in Litchfield County.

Movement of Restricted Plants

Until further notice unless accompanied by a certificate or permit issued by an authorized inspector of the Connecticut Agricultural Experiment Station or Federal Plant Quarantine and Control Administration, the following plants and plant materials cannot be allowed movement from the restricted areas to points outside or from the two-generation area into the one-generation area or from the one-generation area into the two-generation area: corn, broom corn, sorghum and sudan grass, including all parts of leaves and stalks throughout the year; from the two-generation area, all cut flowers and entire plants of chrysanthemum, aster, cosmos, zinnia, hollyhock, gladiolus and dahlia (except gladiolus and dahlia bulbs without stems) throughout the year; for the period between June 1 and December 31, all celery, green beans in the pod, beets with tops, rhubarb, oat and rye straw as such or when used as packing.

Shelled corn must bear a certificate or permit that the corn is clean (except that packages of shelled corn weighing 25 pounds or less to the shipment may be sent without certificate or permit).

This order shall take effect January 15, 1930.

WILLIAM L. SLATE,
Director.

Approved:

JOHN H. TRUMBULL,
Governor.

Summary of Quarantine Regulations

For the guidance of growers and shippers, the regulations about moving crops from the quarantined area (see Figure 45) to the free area are given below:

Movement Not Allowed

Applies throughout the year: Corn on the ear, either green or dry, cornstalks, broom corn, sorghum and sudan grass, including all parts of leaves and stems. Inspections and permits refused.

Movement Allowed with Certificates

Applies throughout the year: From the two-generation area all cut flowers and entire plants of aster, chrysanthemum, cosmos, dahlia, gladiolus, hollyhock and zinnia must be inspected and certified for shipment. (No restrictions on gladiolus and dahlia bulbs without stems.)

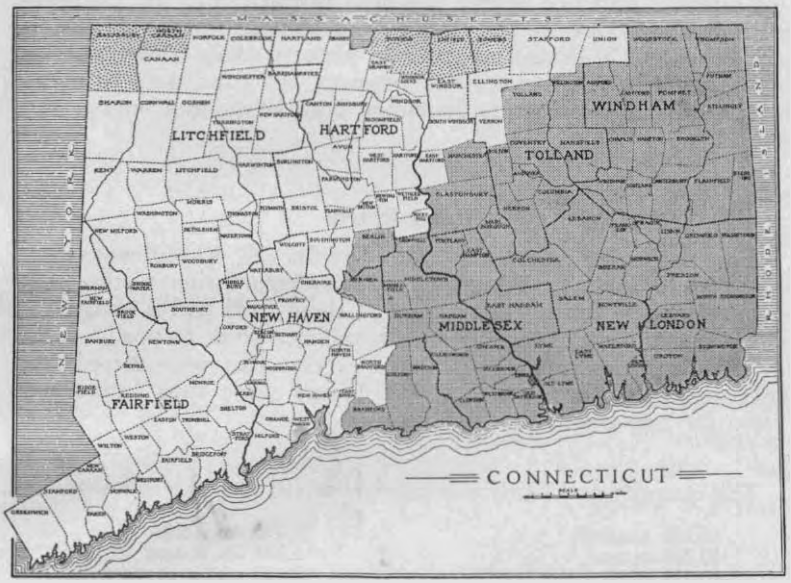


FIGURE 45. Map of Connecticut showing area under State and Federal quarantine on account of European corn borer. Shaded portion at right represents the two-generation area, and is part of the larger infestation extending over Rhode Island, eastern Massachusetts, New Hampshire and southeastern Maine. Lighter shaded portions in northwestern and north central part of the State represent the one-generation area, and are part of the large infestation of western Massachusetts, New York and westward.

Applies from June 1 to December 31: All green beans in the pod, beets with tops, rhubarb, oat and rye straw as such or when used as packing must be inspected and certified. (No restrictions from January 1 to May 31.)

Shelled dry corn: Quantities of 25 pounds or less without restrictions. Larger quantities must bear permit or certificate showing that corn is clean and free from pieces of cobs and stalks throughout the year.

For further information about the European corn borer apply to:

W. E. BRITTON, Connecticut Agricultural Experiment Station, New Haven, Conn. In charge of State regulatory work.

H. N. BARTLEY, 22 Elizabeth St., South Norwalk, Conn. In charge of Federal control work.

Requests for inspection and certification should be made to Mr. Bartley or to local inspectors soon to be announced.

Scouting

Federal men scouted all towns in Connecticut outside of the quarantined area and found 45 towns infested with the European corn borer. Some of the towns were scouted several times. In this work 6,022 fields and gardens were scouted. They covered approximately 7,774 acres and required 867 man days to scout; 854 European corn borers, including both larvae and pupae, were found.

Road Patrol

For the period from June 13 to October 10, 40 highways were patrolled, 34 of them being along the western border of the quarantined area. During this period at these road patrol stations in Connecticut some 3,452,939 motor vehicles were stopped; 7,498 of these vehicles carried prohibited articles that were seized, and infested materials containing 725 borers were thus intercepted from the two-generation area.

The quantity and kinds of materials seized were as follows:

16,166	gladioli	39,695	ears corn
13,350	asters	6,584	lbs. beans
13,003	dahlias	2,660	stalks rhubarb
4,186	zinnias	5	lbs. rhubarb
1,575	cosmos	644	bunches celery
435	chrysanthemums	25	lbs. shelled corn
320	hollyhocks	7,470	beets
15	lbs. beets	125	beet tops
3	lbs. beet tops	52	cornstalks
1	lot cornstalks	85	lbs. oat straw

Most of the borers occurred in corn but some of all the other products were infested. One vehicle carried a dozen ears of sweet corn containing 21 borers, which would have been taken to Washington, D. C., had the shipment not been intercepted by the road patrolmen. Views of three of these road patrol stations are shown on Plates 10 and 11.

For this road patrol work about 140 Federal men were employed. All were in uniform, were deputized by the Station, and wore inspectors' badges supplied by the Station.

NEW REGULATIONS REGARDING THE STOPPING OF MOTOR VEHICLES

W. E. Britton

In 1929, road patrol inspectors were stationed along certain highways in Connecticut to intercept uncertified regulated articles, the movement of which was prohibited by the Japanese beetle quarantine and the European corn borer quarantine. These patrol stations were placed on the margins of the infested areas and only those vehicles passing out of the areas were stopped and examined to ascertain whether or not any prohibited articles were being carried. This form of inspection was continued in 1930, except that the corn borer stations were in different towns, and if anything the system was more rigid and effective than in 1929.

Most automobile drivers showed a spirit of coöperation, but some drivers became very indignant because they had to stop for a minute, and a few refused to stop. They raised the question whether the inspectors had the legal right to stop and search motor vehicles, and some lawyers expressed the opinion that the laws of state and nation do not authorize such measures. Clearly, the Federal Plant Quarantine Act as amended and now in force contains ample authority for such procedure, although of course it applies only to the interstate movement of articles and materials. The state laws and regulations must, therefore, be invoked to cover cases where the points of origin and destination of the shipment are both within the state.

The Connecticut law that gives authority to restrict the movement of plant products, first passed in 1918 and amended in 1925, 1927 and 1929, was intended to provide the necessary authority to deal with such situations. It now stands as Section 2124, General Statutes, revision of 1930, and grants authority to the Director of the Connecticut Agricultural Experiment Station. The chief points in this act are as follows:

1. The Director may designate members of the Station Staff to carry out certain lines of work and employ necessary assistance.
2. May coöperate with agents of the United States Department of Agriculture.
3. May make rules and orders, subject to the approval of the Governor, regarding the destruction or treatment of infested plants.
4. May seize, treat, disinfect, or destroy any plants or plant material moved in violation of any quarantine rule or regulation established under this act, or suspected of being infested by any dangerous insect or plant disease.
6. May designate certain areas or districts wherein all such plants may be destroyed.
7. May promulgate and enforce by appropriate rules and regulations, quarantines prohibiting or restricting the transportation through the state from other states or the District of Columbia, of plant material capable of carrying dangerous pests with reference to which the Secretary of Agriculture has not established a quarantine or determined that such quarantine is necessary.

8. May make rules and regulations for the seizure, inspection, disinfection, destruction or other disposition of plants or plant materials being transported in violation of a Federal quarantine.
9. May establish and maintain a quarantine against any premises, district, town or group of towns after a public hearing with five days' notice.
10. May enter at reasonable times in the performance of duty any public or private premises.
11. Any person aggrieved by such orders may appeal to the Superior Court.
12. Any intereference, or violation of any quarantine or any other rule or regulation established under this Act, is punishable by a fine of not less than $5.00 nor more than $100.

The patrolmen employed on this work were Federal men in uniform. Each had a certificate card signed by the Director of this Station showing that he had been appointed an inspector, and each wore a badge bearing the words "Inspector, Connecticut Agricultural Experiment Station," and the state coat of arms.

In order to strengthen and clarify the rules and regulations, particularly concerning the stopping of motor vehicles, the following quarantine order was issued and given considerable publicity:

Quarantine Order No. 26

CONCERNING PLANT QUARANTINE REGULATIONS

By authority provided in Chapter 31, Public Acts of 1927, as amended by Chapter 45, Public Acts of 1929, the following additional rules and regulations concerning the several plant quarantines now in force, are hereby issued:

1. It is considered a violation to carry contraband or prohibited articles or materials, or regulated articles or materials without the required certificates, from points within any quarantined areas now or hereafter established to points outside the quarantined areas, even though road patrolmen are not present, and on adequate evidence prosecutions may follow.
2. The operators or drivers of all vehicles, boats, pack-animals, and all other persons, shall stop when signaled by an inspector in uniform and wearing the badge of the Connecticut Agricultural Experiment Station, and the inspector may demand information and examine the contents of any vehicles, packages, cargoes or shipments.
3. Wilful or repeated failure of any person to stop on signal or the refusal of any person or persons to permit inspection of contents of package, cargo or shipment, must be considered as a violation or interference and render such person liable to prosecution.
4. Any employer, officer or manager of any firm or corporation, who instructs, orders, aids, or in any manner assists an employee to refuse to stop on signal, or to permit inspection of contents of any vehicles, packages, cargoes or shipments, will be considered as having violated these regulations, and such employer, officer or manager, will be liable to prosecution.

These regulations shall become effective August 5, 1930.

WILLIAM L. SLATE,
Director.

Approved:
JOHN H. TRUMBULL,
Governor.

MOSQUITO CONTROL IN CONNECTICUT, 1930

R. C. Botsford

This report of mosquito control work in Connecticut covers the period from January 1, 1930, to December 31, 1930, and concerns more especially the maintenance of salt marsh areas accepted for state maintenance. It reviews the most important activities of the work, omitting details that seem unnecessary to repeat yearly. The increased appropriation granted in 1929 was used to excellent advantage this season in reclaiming state maintained areas that could not be reached on previous appropriations. Due to the lack of rainfall and the rapid evaporation and drainage of pools left on the ditched salt marshes by high tides, no mosquito breeding developed and maintenance labor was much reduced on areas overhauled last season, thus allowing more time to be spent on areas improperly drained or neglected and capable of sending off large broods.

It seems reasonable to conclude that where an isolated area of salt marsh has been kept free from mosquito breeding for some years, no breeding can occur there even through a long period of rainy weather or other conditions favorable to mosquito development. The reason for this is that the egg supply becomes exhausted and no adults are nearby to replenish it.

Where unditched breeding areas are within flying distance of drained areas, potential spots in ditched areas are kept supplied with eggs. A long period of rainy weather may keep some of these spots flooded if the ditches are too far apart and large broods of mosquitoes may emerge. The following towns are so affected: Hamden and New Haven, from North Haven; the towns of East Haven, Clinton, Saybrook, Lyme and East Lyme from their own unditched areas; a community known as Groton Long Point from Groton, and the eastern edge of Madison from Clinton.

Maintenance work continued as usual; all ditches were patrolled and cleaned up and spur ditches cut where required. The work in the Branford and Guilford areas was especially difficult because many of the ditches were full of mud, which had to be shovelled out with hand shovels. Ditches recut last season were in good condition this season, as were all newly-ditched areas. Tide gates that had been removed last winter were repaired and replaced and kept in operation during the season.

At Shell Beach, Guilford, a new length of culvert pipe with iron tide gate was installed to replace one installed in 1923. Corrugated iron culverts installed in 1923 in Madison and Westbrook are now in bad condition, the outer or ocean ends being worn out by the action of the tide and sand. The outer lengths must be replaced before next season in order to allow drainage of the marshes dependent on these outlets.

The area of state-maintained ditching has increased from 5,065

acres in 1928 to 10,129 acres in 1930. This was due to new ditching accepted for state maintenance in the towns of Norwalk, Westport, Hamden, East Haven, Branford, Clinton, Westbrook, Old Saybrook, Old Lyme, and East Lyme.

New work done under contract by Mr. John F. Ross consisted of completing the ditching work in Hamden, and the installation of nearly 80,000 feet of ditches in Saybrook and about 142,000 feet in Old Lyme. In the towns of Stonington and Groton, funds have been raised by private subscription for ditching their salt marshes. It is planned to start this work in the spring of 1931.

Plate 12 shows views of salt marshes in Saybrook where ditches were cut.

Investigations of fresh water mosquito nuisances in Bristol, New Britain, Pomfret and Colchester showed mosquitoes breeding in polluted bodies of water, street catch-basins, receptacles and swamps.

Mosquito nuisances reported to this Station were investigated and their source removed where possible, or recommendations made.

The reader is referred to the following tabulation for data concerning the status of salt marsh areas:

STATUS OF CONNECTICUT SALT MARSH AREAS, 1930

Town	Salt marsh areas	Salt marsh ditched	Maintained by state	Total cost of ditching	Labor, cost maintenance, 1930	Labor, cost to complete ditching
Greenwich	200	200	none	$22,000.00	.....	.....
Stamford	300	300	300	3,245.80	$ 302.20	.....
Darien	300	300	none	3,800.00	.....	.....
Norwalk	600	600	600	7,500.00	588.70	.....
Westport	400	400	400	5,913.82	430.60	.....
Fairfield	1,200	1,200	1,200	8,400.00	1,322.39	.....
Bridgeport	173	.....	.....	.....	.....	$ 3,000.00
Stratford	1,315	.....	.....	.....	.....	20,000.00
Milford	630	.....	.....	.....	.....	9,500.00
West Haven....	463	222	222	.....[1]	63.62	3,500.00
New Haven	750	750	675	12,000.00	334.18	750.00
Hamden	571	571	571	5,410.19	77.80	.....
North Haven ...	310	.....	.....	.....	.....	3,100.00
East Haven	545	300	300	3,747.52	91.44	1,300.00
Branford	895	895	895	.....	1,247.28	.....
Guilford	1,085	1,085	1,085	20,000.00	1,227.10	.....
Madison	1,315	1,315	1,315	.....	1,105.37	.....
Clinton	785	677	500	10,000.00	301.64	2,000.00
Westbrook	500	500	500	7,428.14	432.04	.....
Old Saybrook ..	1,373	386	386	4,000.00	175.50	11,000.00
Lyme	493	.....	.....	.....	.....	7,500.00
Old Lyme	1,393	1,000	1,000	10,000.00	76.00	3,000.00
East Lyme	424	130	130	1,480.60	73.80	4,000.00
Waterford	204	.....	.....	.....	.....	3,500.00
New London ...	34	.....	.....	.....	.....	500.00
Groton	304	50	50	1,000.00	42.78	4,000.00
Stonington	555	.....	.....	.....	.....	8,500.00
Totals	17,117	10,881	10,129	$125,926.07	$7,892.44	$85,150.00

[1] Ditched with New Haven.

Mosquito Control Work in New Canaan

Fresh water mosquito control work was carried on as usual in New Canaan under the local citizens' committee. The town of New Canaan voted funds for this work, and this Station again appointed Mr. Raymond F. Hart, Special State Deputy in charge. The report of Mr. Hart follows:

To Dr. W. E. Britton, State and Station Entomologist of the Connecticut Agricultural Experiment Station, and to Mr. George T. Smith, First Selectman of the Town of New Canaan.

GENTLEMEN:

I submit, herewith, my report of the season's work in mosquito control in New Canaan, conducted under the supervision of the Connecticut Agricultural Experiment Station. This work covered a period from June 6 to September 17.

Breeding places found totaled 90, as compared with 70 last summer. Of these 90, 42 were newly-discovered, 48 having been found last season.

The principal breeding places were: the filter beds, the Five Mile River and Mead Park. The most important place, the filter beds, required oiling several times during the summer. In June, three beds were oiled; in July, six; and in August, four. Although at other times there was breeding, the beds were dried up before the mosquitoes could hatch out. Besides the six beds, there was heavy breeding in the two concrete holes near the chlorination house, once in July and twice in August and in the storm overflow hole in September; each time oil was applied.

The breeding place next in importance was again the Five Mile River, between Cemetery Street and Nursery Street. In June many larvae were found along the banks of the river between the filter beds and Nursery Street, and this required the clearing of the channel and the removal of weeds. Once in July and once in August many larvae were found in the river just south of the filter beds, and oil was applied. In September there was heavy breeding in the river at Nursery Street and Norwalk Road, and both parts of the river were oiled. A hole in the river bank just opposite the filter beds was oiled in June, July, and August, once each month.

Heavy breeding was found in the swamp in the Mead Park woods in June, and oil was applied. In July the swamp dried up and remained dry. Twice in July and once in August, the ditches in the Park showed breeding and were oiled.

Of the 87 remaining places, 33 were ponds and pools, of which 17 were oiled, three were stocked with fish, eight did not require oiling because they had but few larvae and were in isolated localities, four were left untreated because of the owners' objec-

tions and because they were not a menace to the town, and one because it was tributary to a reservoir; 32 were streams and swamps, of which 24 were oiled, seven did not require oiling, and one drained into a reservoir; 14 were streams and brooks, of which 11 were oiled, two had too few larvae to warrant oiling, and one was left untreated; one was a small tub in the ground in which the water was changed, and fish introduced; seven other places were oiled: a cesspool, a ditch by the roadside, a large barrel in the ground, a stone overflow hole, a quarry hole, a small hole in the ground, and a hole in the base of a tree.

Of the 90, 66 were Anopheles breeding places fairly evenly distributed about the town (22 were within the one-mile radius); of the 66, 47 were newly-found. There was heavy breeding in nine places, as follows:

Anopheles larvae were found throughout the summer in the new pond in the bird sanctuary; testings were made once each month in June and August and twice each month in July and September.

Twice in June, Anopheles breeding was found along the banks of the Five Mile River between the filter beds and Nursery Street; the channel was cleared and the banks cleaned of weeds; oiling was required once in July and three times in September.

Anopheles were found breeding twice in July in Dickerman pond on River Street, and oil was applied each time.

Anopheles breeding was found three times in July and twice in August in Hutchins pond on Lambert Road; the pond was oiled twice in July and once in August.

Many Anopheles larvae were found in Fischer's former ice pond on Smith Ridge Road the latter part of August, and the pond bed was oiled early in September.

Many Anopheles larvae were found along the banks of the upper part of the Silvermine River.

Heavy Anopheles breeding was found twice in August and once in September in Pinkham pond on Ponus Ridge.

Several Anopheles larvae were found in Davenport's pond off Greenley Road in July, August, and September.

Anopheles larvae were found in a marsh and stream off North Wilton Road in July, August, and September, once each month; this place was not treated because the stream was a tributary to the Norwalk Reservoir.

Of the remaining 57, 25 were ponds and pools, of which 14 were oiled, four were stocked with fish, six did not require oiling and one was untreated, because of the owner's objection and because it was not a menace to the town; 19 were swamps and marshes, of which 17 were oiled, and two did not require oiling; 11 were rivers, streams, and brooks, of which 10 were oiled, and one did not require oiling; one was a quarry hole and was oiled; one was a small tub in the ground, where the water was changed and fish introduced.

Practically all of the back yards within a one-mile radius were inspected for breeding. All but one back yard breeding place were eliminated. There were 77 such places found, 68 of which were within the one-mile radius. This compares with a total of 36 last year, with 31 within the one-mile radius. With approximately 31 blocks within this radius, there was thus an average of two breeding places per block this summer. On Forest Street, there were 11 different yards with receptacles breeding mosquitoes and on Grove Street, five such receptacles.

Breeding was found in 16 catch basins about the town, and all these basins were oiled.

The predominating mosquito was again *Culex pipiens*, the house mosquito. *Anopheles punctipennis* ran a close second, as might be expected from the high proportion of Anopheles breeding places: 66 out of 90. (Anopheles larvae were also found in two rainbarrels.) No *Anopheles quadrimaculatus* mosquitoes were found.

The common killifish, *Fundulus heteroclitus*, was put into nine ponds about the town, the purpose being to ascertain whether or not these fish, which are effective in salt-marsh mosquito control work, are also useful against mosquitoes in New Canaan's waters. It is hoped that next summer will shed some light on this question.

The results of my work here for the past two seasons show:

1. That the filter beds constitute the most important breeding place in town and must be carefully watched. Unless the beds are operated so that each bed dries out before the mosquito cycle is completed (7 to 10 days, approximately), they should be oiled.

2. That backyard breeding is a factor of the greatest importance; two breeding places per block is a high average and denotes carelessness on the part of the residents; inspection of back yards is a necessary part of all future mosquito campaigns.

3. That the Silvermine River is one of our most serious problems: Anopheles and other larvae may be found all along the river edges, and there is yet no satisfactory remedy.

4. That the use of fish for mosquito control in New Canaan is highly desirable. The application of oil on the ponds throughout the town is objectionable in many cases, and the simplest and most economical alternative is the use of fish; the problem is to find a native fish that will be an effective destroyer of mosquito larvae. It is expected that the common killifish will prove to be such a fish, and experiments are being conducted to determine this question.

5. That Anopheles breeding is present throughout the town; fortunately, *Anopheles quadrimaculatus*, the more dangerous of the two more common Anopheles species, has not been found this summer.

6. That, notwithstanding the prevalence of *Anopheles punctipennis* in New Canaan during the summer, there have been no reported cases of malaria; this tends to show that *Anopheles*

punctipennis is not commonly a malaria carrier here, in which respect our experience corresponds with that of observers in New Jersey.

In closing, I wish to thank the members of the experiment station staff, the selectmen and other town officials, and the members of the voluntary committee for their helpful suggestions and aid; and the people of New Canaan for their appreciation of our work.

Respectfully submitted,

RAYMOND F. HART,
State Deputy in Charge

MISCELLANEOUS INSECT NOTES

Larvae in rotten stump. On March 18, 1929, Dr. Friend collected some Coleopterous larvae that were borers in a rotten stump in North Haven. On May 29, 1929, an adult emerged and proved to be *Meracantha contracta* Beauvois, a member of the family Tenebrionidae. [W. E. Britton]

Chinch bug injury to lawns. Dr. E. P. Felt reported injury to lawns in Greenwich, in July, 1930, by the chinch bug, *Blissus leucopterus* Say. Dead spots were produced that greatly resembled those caused by the Asiatic beetle. Some of them were 25 to 40 feet in diameter. In former seasons we have recorded lawn injury by the chinch bug, but the spots were usually small, 12 to 18 inches in diameter. Such injury was recorded from Bristol in September, 1914,[1] Hartford in September, 1922,[2] and October, 1929.[3] [W. E. Britton]

The pandorus sphinx. The pandorus sphinx, *Pholus pandorus* Hubn., was more abundant than usual in 1930. This sphinx moth has long been known to occur in Connecticut but is rather rare, and for many years we have not seen a specimen. In August, 1930, nearly full-grown larvae were received from North Haven, on Virginia creeper, August 26; from Norwalk, August 28, and from Rocky Hill, August 29. The moth has a wingspread of about four inches and is generally of olive-green color with lighter and darker olive-green, and pinkish markings.

[W. E. Britton]

[1] Report of this Station for 1914, 188.
[2] Report of this Station for 1922, 369.
[3] Report of this Station for 1929, 499.

Thysanurids in cold frames. On May 29, 1930, Mr. Zappe visited the grounds of a vegetable grower in Branford, and found large numbers of Thysanurids in some of the cold frames where plants had been stored. Apparently the insects had not injured the plants, but were on the soil and in some places were clustered in heaps an inch or more in depth. Mr. Zappe collected hundreds of them. Specimens were sent to Dr. J. W. Folsom, who identified them as *Achorutes manubrialis* Tull., a species common in Europe. It is occasionally found in this country, although it does not yet occur in our literature. [W. E. Britton]

Injury to apple trees by New York weevil. On May 28, 1930, specimens were brought to the Station from the Westwoods section of Hamden with a statement that they had injured young apple trees by eating the bark from the twigs. The specimens proved to be the New York weevil, *Ithycerus noveboracensis* Forst. Mr. Zappe and Mr. Walden visited the orchard on May 29, and found that the weevils had wholly or partially girdled many of the twigs at the base of the new growth, as shown on Plate 17 b. The owner had collected many beetles. The trees were next to a woodland area and probably the beetles were more abundant than in some other locations. [W. E. Britton]

Aphodius larvae in lawn. On July 2, 1930, Mr. McFarland was called to examine a lawn on Mechanic Street, New Haven. There were myriads of small white grubs near the surface, and the grubs had eaten all the grass on an area perhaps 20 feet square. These grubs were identified by Dr. Friend as belonging to the genus *Aphodius*, the species of which usually breed in dung. The Station collection contains 13 species of *Aphodius*. Which of these species, if any, the grubs belong to, cannot be determined until the adults are obtained. Material was collected for rearing and adults may emerge next summer. The entire infested area was treated with carbon disulfide emulsion on July 11.
[W. E. Britton]

Curculionid larvae in soil of perennial bed. During April a complaint was received regarding grubs in the soil about the roots of perennial plants at Waterford. Mr. Zappe visited the place on April 26, and collected some of the grubs and brought them to the laboratory. In due time they transformed and proved to be the larvae of the black vine weevil, *Brachyrhinus sulcatus* Fabr. This species has several times been responsible for injury to *Taxus* plants and other small conifers in nurseries, where the bark of the roots is eaten off by the grubs. Mr. Zappe noticed some of the adult weevils on grapes and ferns in the greenhouse at Waterford. [W. E. Britton]

The sunflower maggot. On August 29, 1929, Mr. Stoddard of the Botany Department, brought in some sunflower stalks that were infested with borers. Dipterous larvae were rather abundant inside the stalks, where they had tunneled an area next to the woody stem, leaving a cylindrical core of pith as shown on Plate 13 c. This is a characteristic form of injury and the insect causing it may be considered as a pest by those who wish to grow sunflowers. On October 1, 1929, similar specimens were brought in from Brooklyn by Mr. Ashworth. Adults were obtained from both lots in May, 1930, and proved to be the sunflower maggot, *Straussia longipennis* Wied., a species considered a pest of cultivated sunflowers in Canada. The infested stems are weakened to such an extent that they break over. Gibson[1] suggests that spraying the leaves and stems of the plants with lead arsenate may be a means of control, as the adult flies feed in about the same manner as the cherry fruit flies. [W. E. Britton]

Mites in greenhouses. The cyclamen mite, *Tarsonemus pallidus* Banks, caused injury to cyclamen plants in a florist's greenhouse in Branford. The house was visited November 26, 1929. On January 2, 1930, Dr. Friend visited a greenhouse in North Haven, and found the same mite injuring cyclamen and snapdragon plants. The infested plants should be sprayed thoroughly about twice a week until the injury ceases, using a nicotine sulfate solution such as "Black Leaf 40," one teaspoonful in a gallon of water, with an inch cube of laundry soap dissolved and added. On November 9, 1929, Dr. Garman visited a greenhouse in Madison and found the place generally infested with the common red spider, *Tetranychus bimaculatus* Harvey. In certain sections of the house the plants had been severely injured and were covered abundantly with the characteristic webs. Dr. Garman suggested that the owner try spraying with Volck, with pyrethrum soap or fumigating with naphthalene. [W. E. Britton]

Abundance of clover mite. On May 2, 1930, complaint was received from Oliver Road, New Haven, regarding small bugs crawling all over the outside of the house and in some of the rooms on the inside. Mr. McFarland visited the place and collected some of the specimens, which proved to be the clover mite, *Bryobia praetiosa* Koch. On May 15, specimens were received from a dormitory of the Connecticut State Normal School in New Britain. This mite is sometimes very abundant on clover, and the eggs are laid in the fall, often near houses or other buildings and sometimes on the trunks of trees. The eggs are reddish in color and when abundant give a distinctly reddish color to the tree, fence or other object on which they are deposited. I have seen them on

[1] Canada Dept. of Agr., Bull. 99, new Series, 46.

coal at an open cellar window. After the eggs hatch in spring, the young mites crawl all over the nearby objects, which in these particular cases were buildings. They sometimes enter the house just after cutting the grass on the lawn. They cause no great annoyance in buildings because they soon go to plants out of doors. When crawling on the outside of a house, they may be washed off with water from the hose or sprayed with nicotine solution and soap. If inside, it is possible to kill many of them by wiping over the woodwork with a rag moistened with kerosene, turpentine or furniture polish. [W. E. Britton]

The strawberry weevil. During the latter part of May a report was received from Branford that strawberry blossoms were being destroyed by a small beetle. A visit was made on May 27 when it was found that the injury was caused by the strawberry weevil, *Anthonomus signatus* Say. About one-half of an acre of berries was on recently cleared land with brush growing on two sides. It was estimated that about three-fourths of the blossoms had been destroyed. A larger field a few hundred feet from the brush area had only about 20 per cent of the blossoms injured. The adult weevils hibernate under leaves and rubbish in hedge rows and the edge of woods or brush land, and strawberries growing nearby are frequently injured. The insect feeds chiefly upon the pollen, and varieties with staminate flowers are attacked in preference to those with imperfect blossoms. The earliest varieties are usually injured more than late varieties. When it is necessary to grow strawberries near brush land, it is recommended to grow a few rows of a very early staminate variety next to the edges of the field to trap the weevils. These plants should be cut and burned about two weeks after they are through blossoming, to destroy the larvae. The egg of this weevil is shown on Plate 13 b. [B. H. Walden]

A curious mite. On January 15, 1931, E. W. Burr, a commercial insect exterminator of West Haven, brought to this office several bread boards from the pantry of a client. These were infested by a small red mite, which on examination proved to be different from others in our collection. It was consequently submitted to Dr. H. E. Ewing of the United States National Museum who determined it as belonging to the genus *Pimeliaphilus,* known only from Europe. So far as can be learned from the literature, however, it has never been reported to be of any economic importance. The genus is one of the red spiders or spider mites, differing from others in this family in the possession of two large claws at the tip of each tarsus, each claw with two tenent hairs attached near the middle. The tracheae are very extensive, those of the collar ending in a conspicuous projection on either side. The hind margin of the body is distinctly notched. [Philip Garman]

Tropical mite, Tarsonemus latus Banks. The mite, *Tarsonemus latus* Banks, described in the 28th Report of the State Entomologist, continued to do damage in 1929, injuring peppers and tomato seedlings grown under glass for early transplanting. They even continued to injure the plants after they were set in the field and in many cases deformed the mature peppers as shown on Plates 18 and 19. Various efforts were made to control it under greenhouse conditions, none of which was successful. Trials were made of pyrethrum soap and nicotine and soap combinations, and Mr. Jacobson of the Soils Department fumigated his portion of the infested house with naphthalene, using four pounds per 1,000 cubic feet. The fumigation killed only 75 per cent of the mites. During the summer when the house was empty, it was fumigated with burning sulfur, the temperature reaching 120 degrees F. during the process. Since then there has been no return of the trouble, although it has appeared in another greenhouse on tobacco plants. Here the pest has been kept under control by removal of infested plants as they appear. [Philip Garman]

Hickory twig girdler. This insect, *Oncideres cingulatus* Say, is not very common in Connecticut; in October, 1930, it was found in East Rock Park, New Haven, where it was causing some injury to young hickory trees planted in a nursery row. The damage is caused by the adult beetle girdling the small twigs about a foot or so from their ends. The twig is girdled completely around the stem, which kills the portion above the injury, and the damaged parts are very conspicuous because the dead leaves remain on the twigs. Windstorms often cause many of the injured twigs to fall to the ground. The eggs of this insect are laid above the girdled portion of the twigs and the young borers live in the dead twigs. When the infestation was first found on October 3, there were many dead twigs on the ground and some were still on the trees. No adult beetles could be found at this time but there were many eggs in the dead twigs. About two weeks later these eggs had hatched and the young grubs were feeding inside the twigs. In the South, this insect causes some damage to pecan trees and is known there as the pecan twig girdler. The remedy is to collect and burn the severed twigs. This insect and injured twigs are shown on Plate 20. [M. P. Zappe]

Woodland defoliated by walking stick. An outbreak of walking stick, *Diapheromera femorata* Say, occurred in the southeastern portion of Voluntown in 1930. This infestation was about three miles southeast of the Voluntown postoffice and was noticed by Mr. J. F. Keough, one of the Federal gipsy moth inspectors, who reported it to Mr. A. F. Burgess, Melrose Highlands, Mass., in charge of Federal moth control. The following note was sent by Mr. Burgess:

"I have received a rather interesting note from one of our inspectors, Mr. J. F. Keough, who is located at Willimantic, Conn. He reports that in September, 1930, he observed a very heavy outbreak of the common walking stick, *Diapheromera femorata,* in woodland in Voluntown, more than 100 acres being infested. The growth consisted of 70 per cent red oak, 15 per cent white oak and the balance a mixture of white pine, pitch pine and gray birch. The heaviest feeding was on the red oak with a smaller amount on the white oak and some on the pitch pine. No feeding was observed on white pine.

"The defoliation ran as follows:

1 acre —80 per cent defoliated
5 acres—50 " " "
10 acres—25 " " "
10 acres—15 " " "

"In the rest of the area, the insects could be found without difficulty and some feeding was noted." A female walking stick is shown on Plate 14 a. [W. E. Britton]

Distribution of Mexican bean beetle in Connecticut. In the Report of the Entomologist for 1929 (Bull. 315, 581-585) is an account of the occurrence of this insect in the western portion of Connecticut, accompanied by a record of the towns at that time found infested. On July 7, Dr. Friend visited a field of garden beans in Orange, where the insect was present in August, 1929. He found larvae of all sizes present and without question the species survived the winter there. Early in June, specimens were sent to the Connecticut Agricultural College from Windham, and we received the insect from Old Lyme, July 31; from Brooklyn, August 1, and Cobalt, October 1. Mr. Wilkinson observed a serious infestation of this pest on pole beans at Norwich, August 5, so we may consider that the pest is now distributed well over the State. The appearance of this insect and its injury is shown on Plate 15. There are two generations each season in Connecticut, and the second generation usually causes more injury than the first. Dr. Friend grew all varieties of garden and lima beans listed in a seedsman's catalogue, and the beetle fed on all of them.

Remedies: Spray shell beans, using about 200 gallons per acre with the following mixture:

Magnesium arsenate	2 pounds
Kayso	3 pounds
Water	100 pounds

Or dust, using 40 pounds per acre, with barium fluosilicate applied to the dry foliage.

Spray string beans with nicotine solution (1 to 500) or pyrethrum soap, and discard the water in which beans are cooked. [W. E. Britton]

Abundance of oak leaf rollers. Oak trees were partially defoliated by leaf rollers in several localities in the central portion of Connecticut in 1930. Mr. Zappe visited Watertown, June 3, and found an area of perhaps 10 acres of red and white oaks possibly one-third defoliated (see Plates 16 and 17). From material collected at Watertown, adults of *Tortrix quercifoliana* Fitch, emerged June 16. On May 28, Dr. Friend collected material from black and red oak, Middlefield, where the trees were stripped, and adults of *Tortrix albicomana* Clem. were reared June 13. On June 4, Dr. Friend observed several pin, red and black oaks which had been defoliated along the highway in the towns of Bethany, Woodbridge, Naugatuck and Middlebury. The writer observed defoliated oak trees in Woodbridge, June 2, and in Marlborough and Hebron, June 4. On June 5, infested material was received from Indian Neck, Branford, on black oak; *Tortrix quercifoliana* adults with hymenopterous and dipterous parasites emerged from it. *Tortrix quercifoliana* was prevalent around Hartford and Stamford, on pin oaks. In 1923, this species defoliated certain trees in Stamford, and in 1924 it was present in both Stamford and Greenwich. *Tortrix albicomana* injured oaks in Keney Park, Hartford, in 1915, and roses in New Haven in 1918 and 1929.

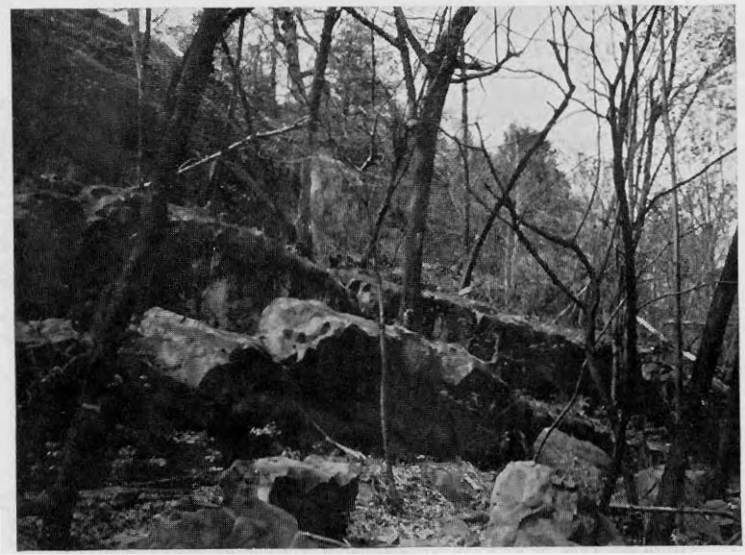
[W. E. Britton]

Leaf-stalk borer of the Norway maple. Dr. E. P. Felt of the Bartlett Tree Research Laboratories, Stamford, has reared a small moth from the leaf petioles of Norway maple. The larva is a miner or borer in the leaf stems and is probably responsible for some of the dropping of the leaves that has been attributed to aphids. This insect normally infests the seeds or keys at the point of the suture where the two seeds are joined together. Many of the immature seeds drop on account of the injury. On trees that are not fruiting, the larva tunnels in the leaf petioles. The insect has been identified by Mr. Busck, of the United States National Museum, as *Nepticula sericopeza* Zell., a species probably introduced from Europe. Dr. Felt has recorded this insect from Bridgeport, Fairfield, Greenwich, Noroton, Norwalk, Ridgefield, Stamford and Westport in Connecticut, from Massachusetts, Rhode Island, New Jersey, eastern Pennsylvania, and several points in New York State, and considers it probable that the insect is generally and widely distributed in the northeastern United States. To the Connecticut localities mentioned above should be added those of Hamden, New Haven and Suffield, where infested seeds were collected in June by Mr. Neely Turner. Dr. Felt reports that he has obtained partial control of this insect by spraying the infested trees late in May with one-half pint of nicotine sulfate, three pounds of soap and two quarts of molasses in 40 gallons of water.

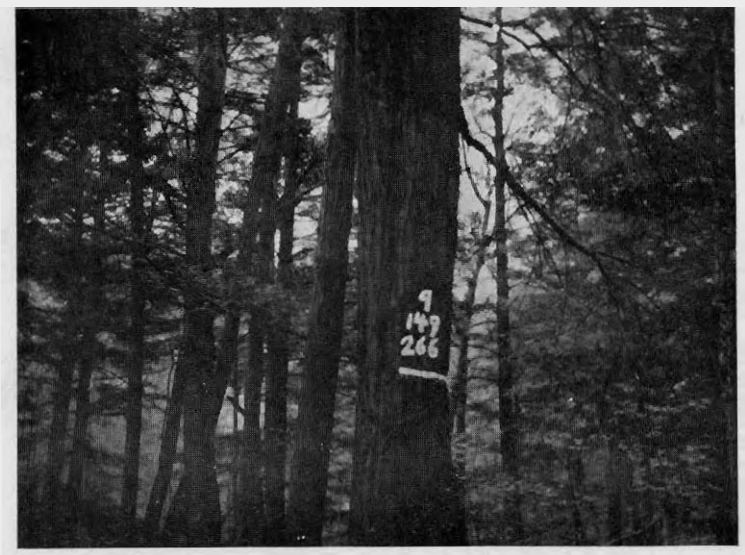
[W. E. Britton]

Rose stem girdler. The rose stem girdler, *Agrilus viridis* var. *fagi* Ratz., was first brought to our attention in the fall of 1925, when portions of injured rose plants were sent to this office. This material was placed in rearing cages in our insectary and the following summer adult beetles were found in the cages, having emerged from the infested rose branches. During the annual inspection of nurseries in 1930, injury by this insect was found practically all over the state wherever its host plants occurred. It is said to attack birch, beech, alder, oak and poplar, but as yet we have only found it on three kinds of roses, *Rosa rugosa*, *Rosa multiflora*, and *Rosa hugonis*. When it becomes more plentiful, it may be found on other kinds of roses. At Bethel, it was very abundant in a hedge of *rugosa* roses and had done considerable damage. In Milford, it caused very serious injury to a block of *rugosa* and *multiflora* roses. This was in the latter part of August and many of the rose branches were broken off and others were dead although still attached to the main plant. It was recorded from 24 localities in 1930, and from only two in 1929. The injury is caused by the larvae of this beetle feeding under the bark of the rose stems, often causing a swelling at this point. As the larvae get larger, they girdle the stem, causing the upper portion to die and many times wind breaks off the injured parts of the plant. Early in the summer, the injury is hardly noticeable, but by a careful search the swellings on the stem can be found. Control for this insect is to cut off and burn infested parts of rose plants as soon as the injury is noticed. As the adult beetles are known to feed on the rose leaves, it has been suggested that spraying with arsenate of lead in June may kill the beetles before the eggs are laid. The swellings or galls caused by this insect are shown on Plate 20 c. [M. P. Zappe]

INDEX



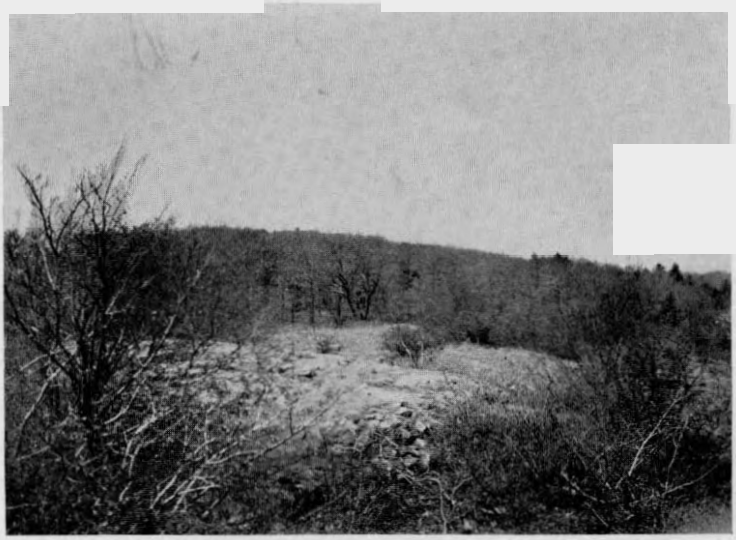
a. View showing ledges and tree growth at gipsy moth infestation, near summit of West Peak, Meriden.



b. Trees marked to show gipsy moth infestation, summit of West Peak, Meriden.

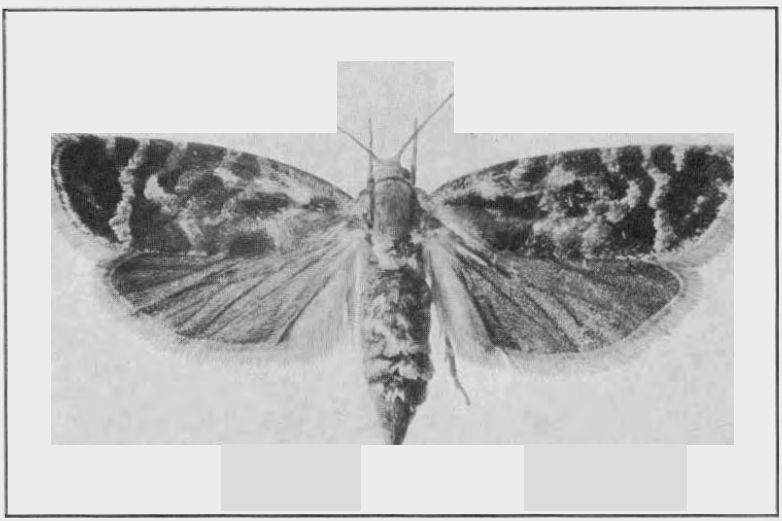
PLATE 2

a. Trees marked to show gipsy moth infestation just north of summit of West Peak, Meriden.



b. View from summit of West Peak, Meriden, showing character of tree growth where gipsy moth infestation occurred.

a. View on Main Street, Branford, where a gipsy moth infestation was discovered in 1930.



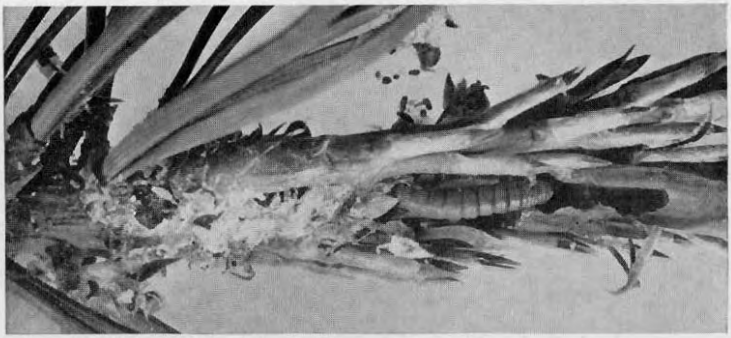
b. European pine shoot moth, adult, four times enlarged.

GIPSY MOTH AND EUROPEAN PINE SHOOT MOTH

a. Young red pine with bushy tips caused by bud injury due to feeding of larvae of European pine shoot moth.

b. Young red pine with tips of branches injured by the larvae of the European pine shoot moth.

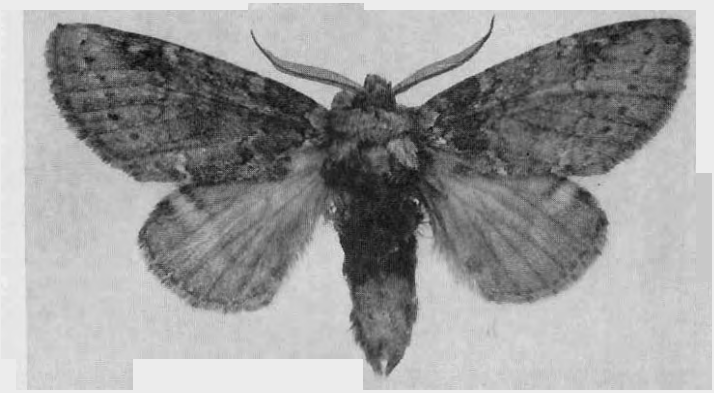
EUROPEAN PINE SHOOT MOTH



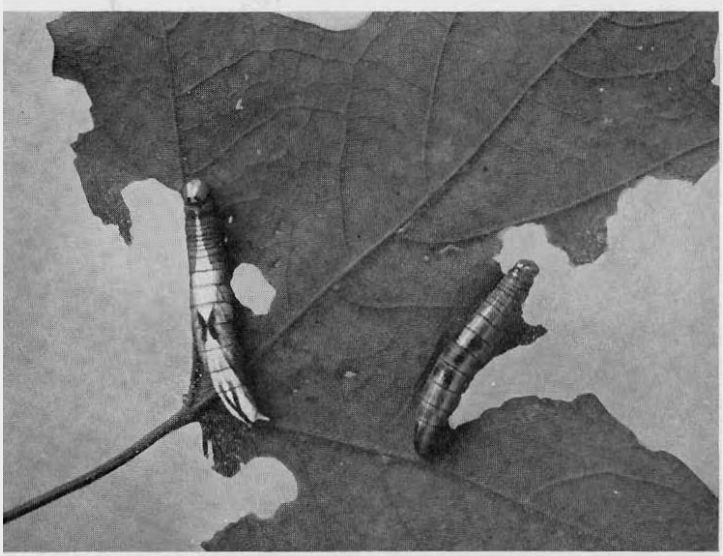
a. Larva of the European pine shoot moth in new growth of red pine. Enlarged twice. Photographed May 13, 1930.

b. Young red pine with typical tip injury to leader and branches caused by the larvae of the European pine shoot moth.

EUROPEAN PINE SHOOT MOTH



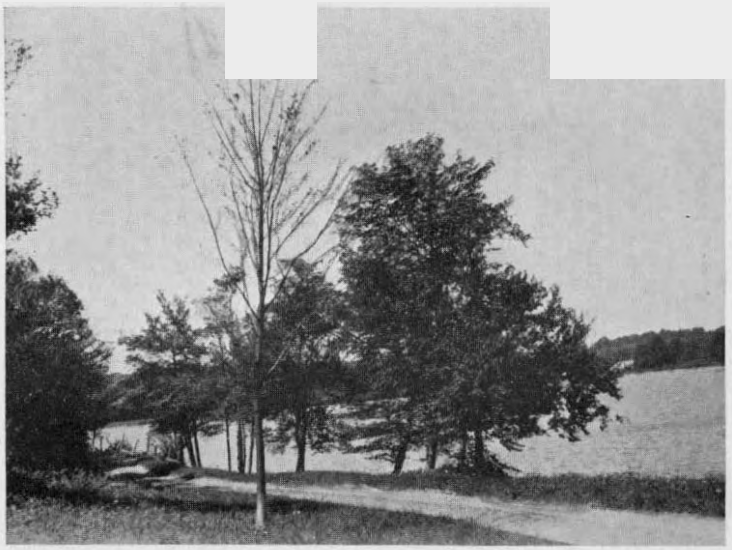
a. The saddled prominent, adult moth, twice natural size.



b. Larvae or caterpillars of the saddled prominent, natural size.

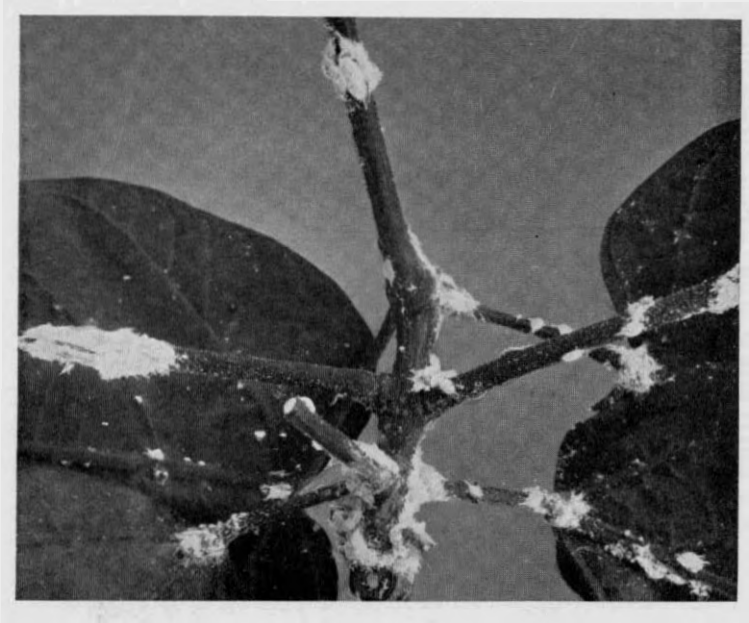
SADDLED PROMINENT

a. Larvae or caterpillars of the saddled prominent, natural size.



b. Sugar maple tree defoliated by caterpillars of the saddled prominent.

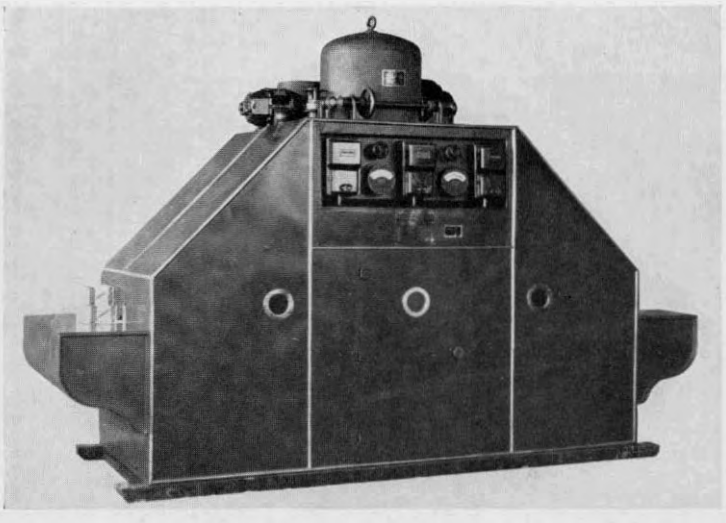
SADDLED PROMINENT



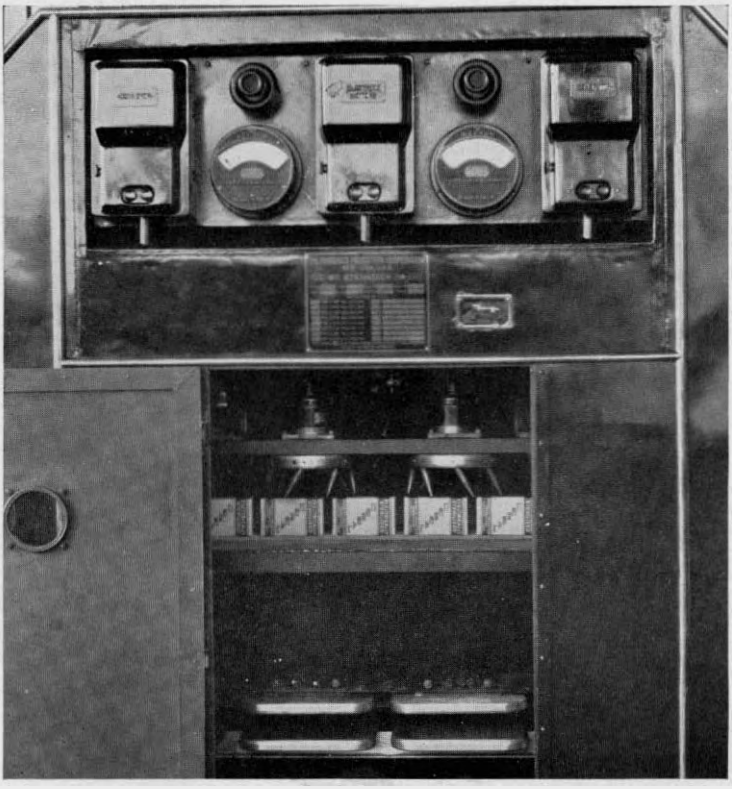
a. Catalpa twig showing mealy bugs, natural size.

b. Base of catalpa tree showing mealy bugs

CATALPA MEALY BUG



a. Side view of electric sterilizer for killing insects in packages of milled cereals. Length about 13 feet.



b. Enlarged view of controls with doors open to show position of packages of cereals passing beneath the contact points.

ELECTRIC STERILIZER

PLATE 10

a. View of road patrol station on New Haven-Middletown turnpike, 1930.

b. View of corn borer clean-up. Burning cornstalks in Woodmont, 1930.

EUROPEAN CORN BORER

a. Inspecting truck at road patrol station on Boston Post Road in Branford.

b. View at road patrol station, Wallingford-Meriden highway.

a. Starting lateral ditch at tidal outlet, Saybrook.

b. Measuring and inspecting new ditches in Saybrook.

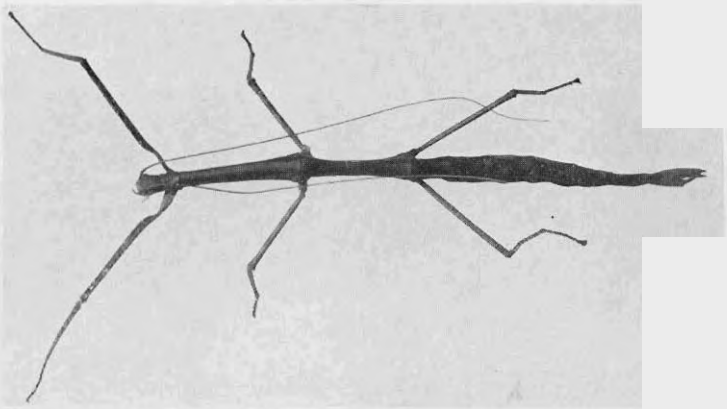
a. Apple soiled with leafhopper excrement, natural size.

b. Strawberry blossom showing egg of strawberry weevil, four times enlarged.

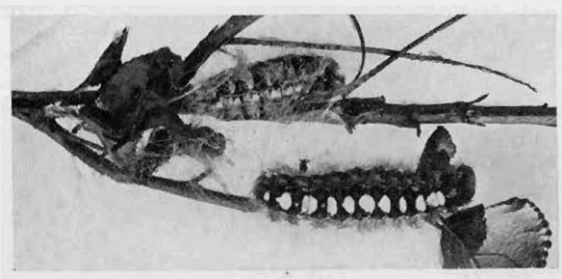
c. Sunflower maggot in stems of sunflower, natural size.

SUNFLOWER MAGGOT, STRAWBERRY WEEVIL AND WORK OF LEAFHOPPERS

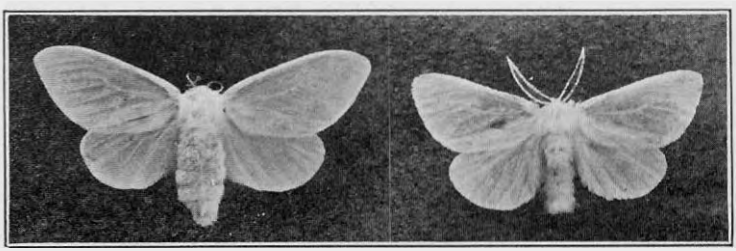
PLATE 14



a. Walking stick, female, natural size.

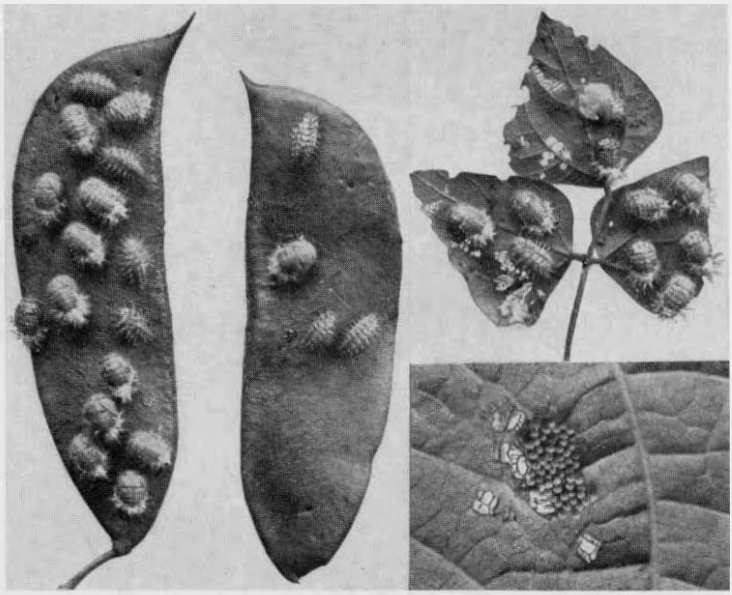


b. Caterpillar and cocoon of satin moth, natural size.

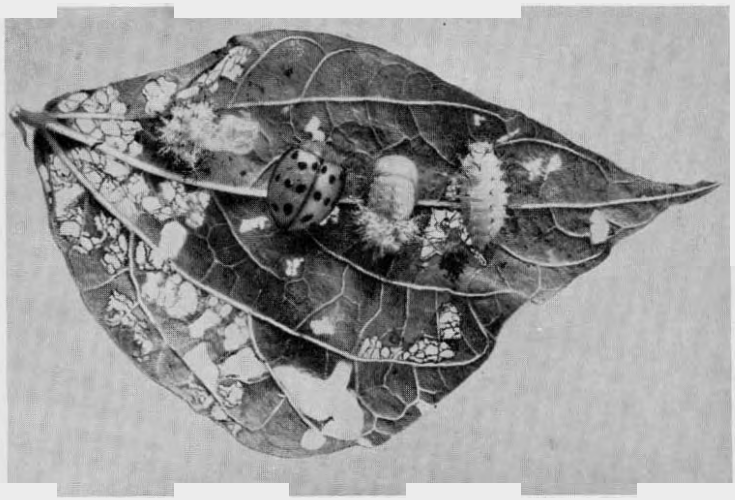


c. Female and male satin moths, natural size. (After Burgess and Crossman, Dept. Bull. 1469, U. S. Dept. Agr.)

WALKING STICK AND SATIN MOTH



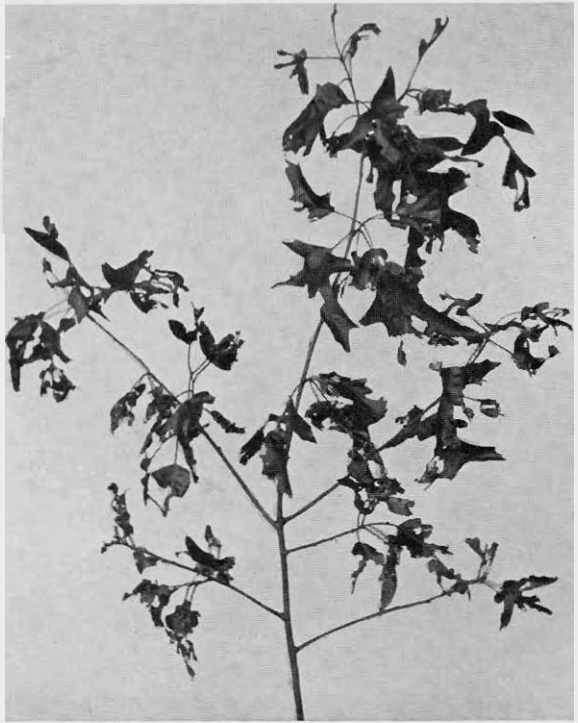
a. Larvae and pupae above, natural size; egg in lower right-hand corner, twice natural size.



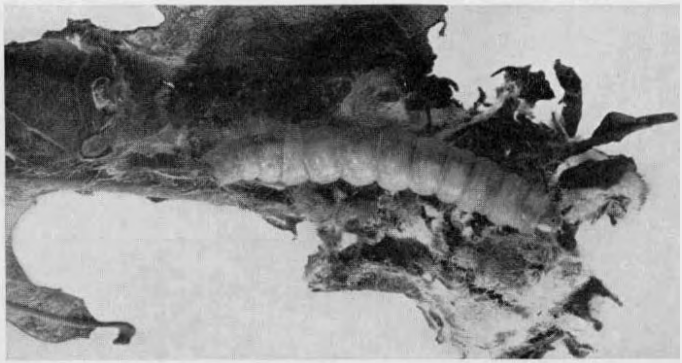
b. Larva, pupa and adult on bean leaf, natural size.

MEXICAN BEAN BEETLE

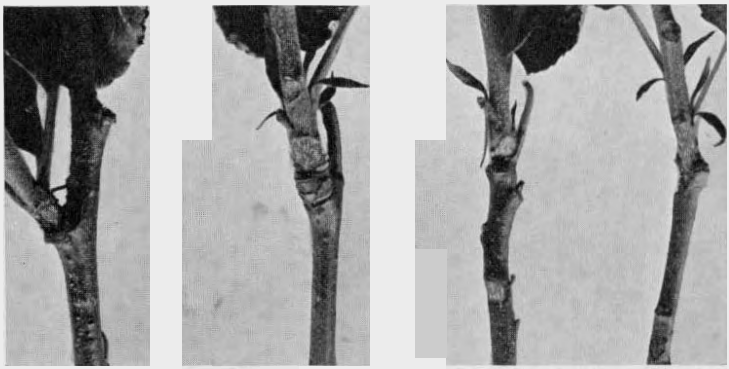
a. Pin oak nearly defoliated by oak leaf roller.



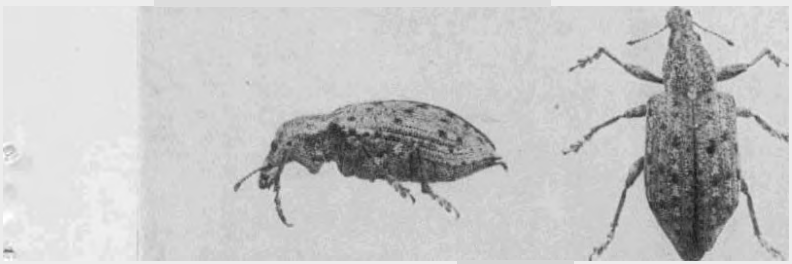
b. Oak leaves eaten by oak leaf roller.



a. Oak leaf roller, larva, eight times enlarged.



b. Apple twigs injured by New York weevil, natural size

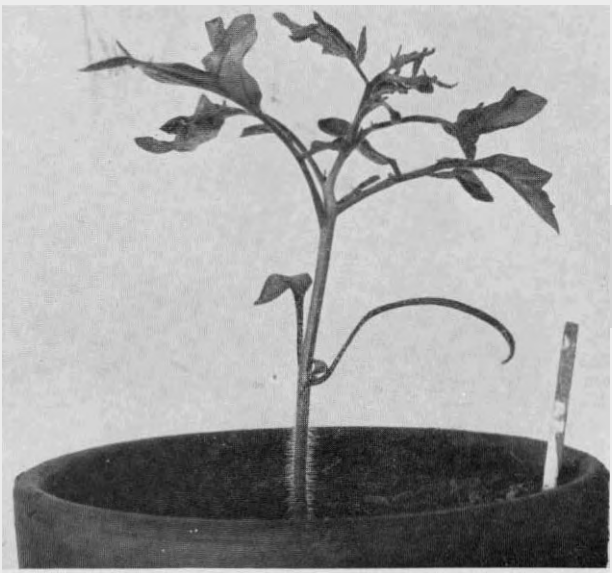


c. New York weevil, adults, twice natural size.

OAK LEAF ROLLER AND NEW YORK WEEVIL

PLATE 18

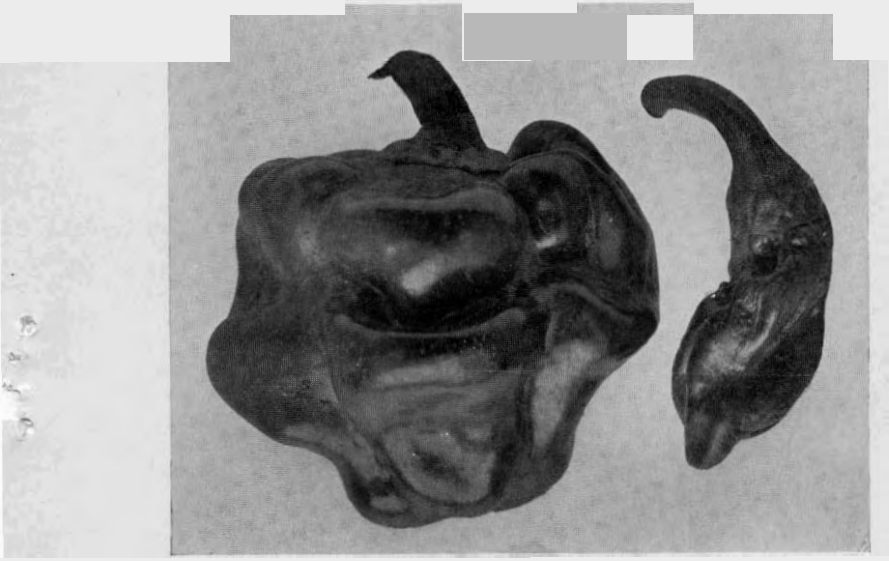
a. Seedling pepper plants injured by a tropical mite, *Tarsonemus latus*



b. Tomato plant injured by *Tarsonemus latus*.

INJURY BY TROPICAL MITE

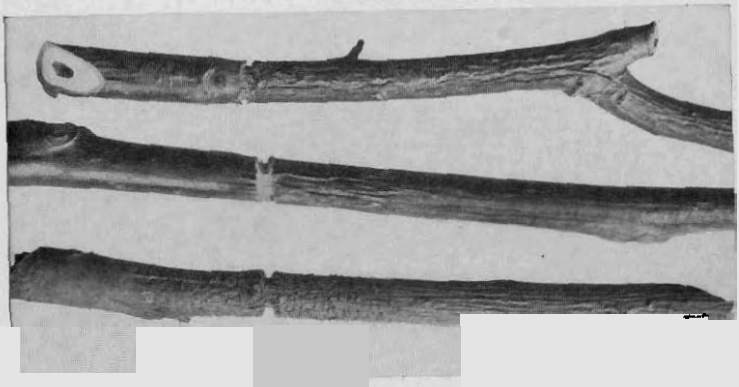
a. Pepper plant injured by *Tarsonemus latus*.



b. Peppers injured and distorted by *Tarsonemus latus*.

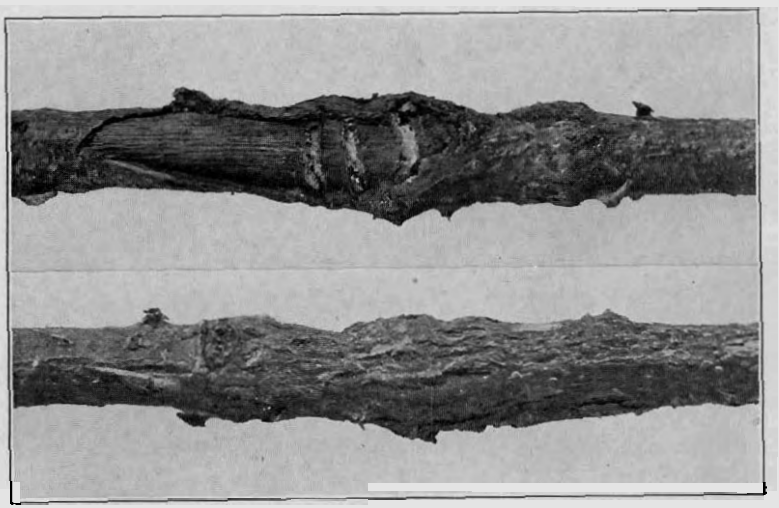
INJURY TO PEPPERS BY TROPICAL MITE

PLATE 20



a. Twigs girdled by hickory twig girdler.

b. Hickory twig girdler, adult beetle, twice natural size.



c. Rose twigs showing swellings or galls caused by the rose stem girdler, twice natural size.

HICKORY TWIG GIRDLER AND ROSE STEM GIRDLER