Bulletin 338 May, 1932

CONNECTICUT STATE ENTOMOLOGIST
THIRTY-FIRST REPORT
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W. E. BRITTON, PH.D.
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CONNECTICUT STATE ENTOMOLOGIST

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W. E. Britton

ENTOMOLOGICAL FEATURES OF 1931

After a rather mild winter, characterized neither by low temperatures nor by heavy snowfall, there was promise of an early spring, but plant development was retarded by cool weather and vegetation developed in normal manner and season. Rainfall was much more frequent and abundant throughout the growing season than in 1930. On account of the cool weather in May and June there was much injury to corn and bean crops from seed corn maggot. Some of the more important features were the great amount of injury by the elm leaf beetle, the Mexican bean beetle, and gladiolus thrips, unusual abundance of apple leafhoppers, spread of the satin moth, Japanese beetle, European corn borer, and scarcity of the Eastern tent-caterpillar.

The following brief notes constitute an insect pest survey of the season. They have been reduced and tabulated to save space and expense in printing. The more important matters are described in greater detail in special articles and notes in the pages of this report.

Fruit Insects

Scientific name	Common name	Locality	Remarks
Aegeria exitiosa	Peach borer		Moderately abundant in peach orchards in September.
Aphis pomi	Green apple aphid	New Canaan	Moderately abundant late in June, decreasing after July 15.
Aphis roseus	Rosy apple aphid	New Haven	Slight infestation in Hamden. Some orchards in New Haven and Hartford Counties injured. Severe injury in Wallingford; little injury in other parts of the state.
Aspidiotus perniciosus	San José scale		Rather scarce everywhere.

Fruit Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Brachyrhinus sulcatus	Black vine weevil	Ellington Vernon	Injuring strawberry, July 3.
Cacoecia argyrospila	Fruit tree leaf roller	Greenwich	Considerable injury to apple in one orchard, June 26.
Carpocapsa pomonella	Codling moth	East Haddam	Present in usual numbers throughout the state.
Cecidomyia viticola	Grape tube gall	Branford	On grape, July 14.
Conotrachelus nenuphar	Plum curculio	Woodbury Glastonbury Plantsville	Exceedingly abundant everywhere throughout the state.
Datana ministra	Yellow-necked caterpillar	New Haven Orange	Usual numbers on young apple trees.
Empria sp.	Sawfly larvae	New Britain	On strawberry, August 15.
Eriophyes pyri	Pear leaf blister mite	New Britain	Present in most pear orchards and in some apple orchards.
Eriosoma lanigera	Woolly apple aphid	Bridgeport	Present in usual numbers.
Gracilaria elotella	Apple bark miner	Meriden	In apple twigs, February 24.
Grapholitha molesta	Oriental fruit moth.	Hartford, New Haven and New London Counties	Light infestation in June, an unusually heavy second brood in July. Third brood in September more abundant than in 1930.
Gryllus abbreviatus	Cricket	Long Hill	Injuring strawberry, October 8.
Hemerocampa leucostigma	White-marked tussock moth	Kensington	Egg mass, November 28.
Lagoa crispata	Crinkled flannel moth	Niantic East Woodstock, Norwalk	On oak, apple and strawberry, in August.
Lasioptera vitis	Grapevine tomato gall	Beacon Falls	Present each year. June.

Fruit Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Laspeyresia prunivora	Lesser apple worm	New Haven County	Unusually common. Injury on Baldwin and Greening at harvest time.
Lygaeus kalmii	Lygaeid bug	Somers	On cultivated blueberry, July 9.
Lygidea mendax	Apple redbug	Glastonbury	No particular injury. Scarce.
Myzus persicae-niger	Black peach aphid	Guilford	On peach, June 15.
Myzus ribis	Currant aphid	Vernon Center	Present in usual numbers everywhere and considerable damage to small plot in Ridgefield.
Oberea bimaculata	Raspberry cane borer	West Hartford Springdale Groton	In raspberry and loganberry in July and September.
Ormenis pruinosa	Mealy flata	West Hartford	On raspberry, July 23.
Oxyptilus periscelidactylus	Grape plume moth	New Haven	Present in usual numbers in May.
Pachystethus lucicola	Light-loving grapevine beetle	New Haven	More prevalent than usual, injuring grape, bean and other plants.
Paragrotis messoria	Climbing cutworms	Durham Center	Devoured new growth on newly budded apple trees in May and June.
Paratetranychus pilosus	European red mite	Meriden Bristol	Present but not abundant in nearly every apple orchard, caused little or no injury.
Pelidnota punctata	Spotted grapevine beetle	New Haven Bridgeport Hartford	Unusually abundant, feeding on grape leaves.
Phobetron pithecium	Hag moth	Bristol	On apple, September 1.
Psyllia pyricola	Pear psylla	New Britain	Present in practically all pear orchards. Caused considerable injury.
Rhagoletis pomonella	Apple maggot	West Hartford Hamden, Somers, East Haddam, Plantsville	Very prevalent and caused serious injury to fruit.

Fruit Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Samia cecropia	Cecropia moth caterpillar	East Woodstock, Killingworth, North Woodbury	On apple and other rosaceous plants.
Scolytus rugulosus	Shot-hole borer	Yalesville	In sweet cherry, March 20.
Sphecodina abbottii	Abbot sphinx	Bristol Hamden	Feeds on grape, Virginia creeper, and Boston ivy in July.
Tyloderma fragariae	Strawberry crown borer	Ellington Vernon	Injuring strawberry, July 3
Typhlocyba sp.	Apple leafhoppers	Woodstock	Exceedingly abundant. Serious infestation in Woodstock. Second brood abundant in Hartford and New Haven Counties.
Typophorus canellus	Strawberry root worm	Center Groton	Injuring leaves, May 9.
Zeuzera pyrina	Leopard moth	Hamden Hartford	Seems to be increasing as a borer in apple trees.

Vegetable Insects

Acrosternum hilaris	Green stink bug	Glastonbury Litchfield Middletown	Reported as injuring beans in August.
Anasa tristis	Squash bug	Bristol Noank	Present in usual abundance.
Cirphis unipuncta	Armyworm	Manchester	Feeding on corn, September 2.
Crioceris asparagi	Asparagus beetle	Falls Village	Present in usual numbers everywhere, May 29.
Crioceris duodecempunctata	Spotted asparagus beetle	Falls Village	Unusually abundant.
Diabrotica vittata	Striped cucumber beetle	Botsford Bristol Hamden	Very abundant and injured cucumber, melon and squash plants.
Diacrisia virginica	Yellow woolly bear	Middletown	Feeding on bean and onion, July 1.

Vegetable Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Diaphania nitidalis	Pickle worm	Branford Bridgeport Cos Cob Hamden Southington Southport Trumbull Westport	First record of injury in the state. Cucumber and summer squash damaged in September.
Epicauta marginata	Margined blister beetle	Simsbury	Injuring Swiss chard, July 24.
Epilachna corrupta	Mexican bean beetle	Throughout the state	Severe injury to beans in Fairfield and New Haven Counties. Received from 28 localities.
Epitrix cucumeris	Potato flea beetle	Throughout the state	In Brooklyn and Danielson, potato fields had 25 per cent of leaves injured, June 26.
Heliothis obsoleta	Corn ear worm	Throughout the state	More abundant than for many years.
Heterodera radicicola	Eelworms or nematodes	Hamden Nichols	Injuring lettuce, tomato and cucumber, June 26.
Hylemyia brassicae	Cabbage maggot	Throughout the state	Especially abundant in Windham County.
Illinoia pisi	Pea aphid	Danielson Putnam Vernon	Not generally destructive, but common at these places latter half of June.
Lygus pratensis	Tarnished plant bug	New Haven	Injuring celery, November 25.
Melittia satyriniformis	Squash borer	Waterbury	Prevalent everywhere throughout the state in July and August.
Myzus persicae	Spinach aphid	Stratford	Infesting carrot, July 3.
Noctuid larvae	Cutworms		Caused severe injury to vegetable plants everywhere.
Pachystethus lucicola	Light-loving grapevine beetle	Hartford Norwich Simsbury	Feeding on beans in July.

Vegetable Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Papaipema nitela	Stalk borer	Warehouse Point	Present everywhere in herbaceous stems.
Pegomyia hyoscyami	Spinach leaf miner	Ledyard	Not prevalent, but injured beet and spinach in Ledyard June 26.
Phlegethontius quinquemaculata	Tobacco worm	Suffield	Larvae present, August 25.
Phlegethontius sexta	Tomato worm	West Haven	Larvae present, July 24.
Plutella maculipennis	Diamond-back moth	Brooklyn Danielson Hamden	Very abundant, June 26, and injured cabbage, cauliflower, and Brussels sprouts.
Psila rosae	Carrot rust fly	New Haven	Not generally prevalent.
Pyrausta nubilalis	European corn borer	Guilford Hamden	Very abundant in New London County, September.

Shade and Forest Tree Insects

Adelges abietis	Spruce gall aphid	New Britain Stony Creek Stratford	Common throughout the state forming basal galls on Norway spruce.
Adelges pinicorticis	Pine bark aphid	Ridgefield West Haven	On white pine throughout the state.
Agromyza clara ?	Catalpa leaf miner	South Manchester	Probably this species, but adults were not reared.
Anisota rubicunda	Green-striped maple worm	Middletown	Caterpillars on maple June 3.
Anisota senatoria	Orange-striped oak worm	Danielson Deep River	Caterpillars on oak and maple.
Argyresthia thuiella	Arborvitae leaf miner	Woodbridge	Slight injury to trees and hedges.
Camponotus herculeanus pennsylvanica	Carpenter ant	Bridgeport Wethersfield	Tunneling in white fringe in Wethersfield.
Chaitophorus lyropicta	Norway maple aphid	New Haven South Manchester	Abundant on Norway maple in many localities late in June.
Chionaspis pinifoliae	Pine leaf scale	Branford Derby Greenwich Salisbury West Haven Winsted	Throughout the state on red, Scotch, mugho and Japanese red pines.

Shade and Forest Tree Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Chlamys gibbosa	A leaf beetle	Deep River	Feeding on oak leaves, July 27.
Citheronia regalis	Regal moth	Guilford Stonington	Caterpillar on black walnut.
Conotrachelus juglandis	Walnut curculio	Greenwich Stamford	Injures Japanese and Persian walnut in July.
Corythuca arcuata	Oak lacebug	Cobalt New Hartford	On white oak in July.
Corythuca ciliata	Sycamore lacebug	New Haven	Very abundant.
Cyllene caryae	Hickory borer	South Manchester	In dwelling, April 6, probably emerged from firewood.
Cyllene robiniae	Locust borer	Bristol	September 1.
Dasyneura communis	Maple vein gall	Winsted	Frequent on sugar maple leaves.
Datana integerrima	Walnut caterpillar	Granby	Common everywhere on hickory, black walnut and butternut in August and September.
Diapheromera femorata	Walkingstick	New Haven	Feeding on oak leaves September 30.
Dichelonyx diluta	A leaf beetle	New Haven	Feeding on oak leaves June 15.
Euvanessa antiopa	Spiny elm caterpillar	Orange	Caterpillars on elm June 11.
Fenusa pumila	European birch leaf miner	Farmington Greenwich Monroe Westport	Common everywhere in gray birch.
Galerucella luteola	Elm leaf beetle	Canaan Guilford Hartford Hazardville Litchfield Noroton Norwalk Warehouse Point Willimantic Wilton	More destructive than for many years.

Shade and Forest Tree Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Gillettea cooleyi	Blue spruce gall aphid	Seymour Southington Waterbury	Common, forming terminal galls on blue spruce.
Gossyparia spuria	European elm scale	West Hartford	Fairly common on young trees.
Halisidota caryae	Hickory tussock moth	Pine Orchard	Caterpillars on linden, July 27.
Hamamelistes spinosus	Spiny witch hazel gall aphid	New Milford North Haven	Abundant on gray birch in June.
Hemerocampa definita	Definite-marked tussock moth	Canterbury	Egg-cluster, March 13.
Hemerocampa leucostigma	White-marked tussock moth	Bridgeport	Caterpillars, June 13.
Heterocampa guttivitta	Saddled prominent	Norfolk	Present in smaller numbers than in 1930.
Itycorsia or *Tetralopha* sp.		Chester Derby Glastonbury Guilford Putnam Wallingford	Forming balls of frass on red, Scotch, mugho and white pines. Some contained lepidopterous head capsules; others of a sawfly. Adults not reared.
Melanoxantherium smithiae	Brown willow aphid	Middletown	On willow twigs in May.
Neodiprion lecontei	Red-headed sawfly	Cromwell Hartford Watertown	On red and mugho pine in September and October.
Neodiprion pinetum	Abbot's sawfly	Derby Roxbury	On white pine, July and October.
Nerice bidentata	Two-toothed prominent	Hartford	Feeding on oak leaves, September 3.
Pachypsylla celtidisgemma	Hackberry bud gall	Bridgeport Mount Carmel	Common on hackberry.
Paratetranychus ununguis	Spruce mite	Seymour	

Shade and Forest Tree Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Phenacoccus acericola	Woolly maple leaf scale	Bridgeport Fairfield Manchester Waterbury Windsor Windsor Locks	Unusually abundant throughout the state on sugar maple.
Philosamia cynthia	Cynthia moth	New Haven	Caterpillars common on ailanthus in August.
Phyllocoptes quadripes	Maple bladder gall	Putnam	Common on silver maple.
Phylloxera caryae-caulis	Hickory gall aphid	Bridgeport Stamford	Common on hickory everywhere in June.
Physokermes piceae	Spruce gall scale	Mount Carmel	Globular scale on spruce, June 16.
Pissodes strobi	White pine weevil	Glastonbury Middletown Salisbury	Destructive throughout the state on young white pines not under shade.
Plagiodera versicolora	Imported willow leaf beetle	Hamden Milford Southport	Common throughout the state on glossy leaved willows.
Porthetria dispar	Gipsy moth	Putnam	Present over eastern two-thirds of state.
Prionus sp. ?	Prionus	Norwalk	Large larva in pink dogwood.
Priophorus acericaulis	Maple leaf stem borer	Glastonbury Mount Carmel Watertown	More prevalent than for several years.
Prociphilus imbricator		New Haven	On beech leaves, June 9.
Prociphilus tessellata	Alder woolly aphid	New Britain	On silver maple, July 7.
Pseudococcus comstocki	Catalpa mealybug	Hartford Norwalk	Increasingly abundant on catalpa.
Rhyacionia buoliana	European pine shoot moth	Baltic Guilford Greenwich Hampton Norwalk	Very destructive to red and Scotch pine in southwestern quarter of the state.
Rhyacionia comstockiana	Pitch twig moth	Guilford Scotland	On red pine, November 7.
Rhyacionia frustrana	Nantucket pine moth	Baltic	On red pine, November 7.

Shade and Forest Tree Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Saperda candida	Round-headed apple tree borer	Mount Carmel	Tunneling in mountain ash, June 16.
Stilpnotia salicis	Satin moth	Eastern three-fourths of state	Caterpillars feed on willow and poplar.
Tetranychus bicolor	Oak mite	Rockville	Injuring oak, September 5.
Thecodiplosis liriodendri	Tulip tree spot gall	Greens Farms Salisbury	Fairly common on leaves of tulip tree.
Thyridopteryx ephemeraeformis	Bag worm	Bridgeport	Many larvae on arborvitae, perhaps brought from a more southern latitude.
Tomostethus bardus	An ash sawfly	Hartford	Larvae devouring leaves, June 3.

Insects of Ornamental Shrubs and Vines

Alypia octomaculata	Eight-spotted forester	New Haven	Devouring Virginia Creeper, June 24.
Chionaspis euonymi	Euonymus scale	Greenwich New Haven Storrs	Infests Euonymus, bittersweet and Pachysandra.
Dichomeris marginellus	Juniper webworm	Meriden Norwalk	Destructive to juniper. Common.
Laertias philenor	Pipe-vine caterpillar	Danielson	Feeds on Dutchman's pipe wherever this vine grows.
Lepidosaphes ulmi	Oyster-shell scale	Old Lyme	On box, April 16.
Neolecanium cornuparvum	Magnolia scale	New Haven	On twigs of magnolia, August 10.
Oberea sp.	Twig borer	Greenwich	In azalea, August 26.
Omphalocera dentosa	Barberry webworm	New Britain	Caterpillars on Japanese barberry, September 25.
Papilio troilus	Green swallowtail	Bethany Farmington Hamden West Haven	Feeding on sassafras and bittersweet in August and September.

Insects of Ornamental Shrubs and Vines—*(Continued)*

Scientific name	Common name	Locality	Remarks
Pholus pandorus	Pandorus sphinx	New Haven Plantsville	Rare. Caterpillar feeds on grape and Boston ivy.
Podosesia syringae	Lilac borer	Bridgeport	In lilac, May 9.
Stephanitis rhododendri	Rhododendron lacebug	New Haven Rockville	Common on mountain laurel and *Rhododendron maxima.*
Tetraleurodes mori	Mulberry whitefly	Glastonbury Meriden New Haven	Abundant on different kinds of shrubs and trees.

Insects of Flowers and Greenhouse Plants

Anuraphis tulipiferae	Tulip aphid	Hartford	Injuring gladiolus corms, May 22.
Asynonychus godmani	Fuller's rose beetle	Norwalk	Collected on acacia flowers under glass, August 26.
Chelymorpha cassidea	A tortoise beetle	Glastonbury New Haven	Feeds upon morning glory.
Diabrotica longicornis	Corn root worm	Wallingford	Injuring rose, September 25.
Emphytus cinctus	Coiled rose slug	Riverside	This sawfly enters the cut stems of roses to pupate.
Epicauta marginata	Margined blister beetle	Darien	Feeding on calendula.
Epicauta pennsylvanica	Black blister beetle	Darien New Haven	Feeding on calendula and other flowers.
Heliothis obsoleta	Corn ear worm	Bridgeport Hartford Portland	Injured geranium cuttings under glass.
Julus hortensis	Garden millipede	West Hartford	Injury to sweet pea under glass, April 18.
Lygus pratensis	Tarnished plant bug	Guilford	Injured dahlia buds.
Macronoctua onusta	Iris borer	Hamden	Larvae injured iris rootstocks in July.
Pseudococcus citri	Mealybug	Noank	On oleander. Common on various plants under glass.

Insects of Ornamental Shrubs and Vines—*(Continued)*

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Insects of Flowers and Greenhouse Plants—*(Continued)*

Scientific name	Common name	Locality	Remarks
Pyrausta ainslei	Smart-weed borer	Terryville	Tunneling in stem of golden glow.
Reticulitermes flavipes	White ant	West Haven	Injuring geranium plants, June 29.
Rhizoglyphus hyacinthi	Bulb mite	Hamden	Had injured blazing star *(Liatris)* July 22.
Rhynchites bicolor	Rose curculio	Fairfield	Weevil eats holes into the buds.
Saissetia hemisphaerica	Hemispherical scale	Canaan Noank	On Boston fern and oleander.
Sibine stimulea	Saddle-back caterpillar	Norwalk	Feeds upon various garden plants.
Taeniothrips gladioli	Gladiolus thrips	Bridgeport Hartford Meriden Wethersfield	Severely injured gladiolus in various sections of the state.
Tarsonemus pallidus	Cyclamen mite	Fairfield Orange New Haven	Distorts leaves of cyclamen, larkspur and monkshood.
Tetranychus telarius	Red spider	Bristol Willimantic Woodbury	Had injured phlox, coleus, lantana and chrysanthemum.
Trialeurodes vaporariorum	Greenhouse whitefly	Noank	On oleander. Injures many different plants under glass.
Vanessa cardui	Painted lady	New Haven	Caterpillars injured hollyhocks.
Vespa crabro	Giant hornet	Yalesville	Girdles twigs

Field, Lawn and Soil Insects

Agapostemon virescens	A green bee	West Haven	Adults from lawn.
Anomala orientalis	Asiatic beetle	New Haven	Lawns severely injured by the grubs.
Bibio albipennis	A fly	Pomfret Center	Many larvae in soil. Of no economic importance.
Blissus leucopterus	Chinch bug	West Haven	Injuring lawn.

Field, Lawn and Soil Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Brachyrhinus sulcatus	Black vine weevil	Greenwich New Haven Woodbridge	Injured Taxus, begonia and other plants.
Cotalpa lanigera	Goldsmith beetle	Hamden	Adult, June 16.
Crambus caliginosellus	Corn root webworm	Preston Plains Windsor	Injuring tobacco in August and lawns in June.
Diplotaxis sp.	White grubs	Hamden	Grubs in soil, May 19.
Eristalis tenax	Drone fly	Stafford Springs	Pupa in soil.
Euphoria inda	Bumble flower beetle	Greens Farms	Adults, September 12.
Hyperodes porcellus	A weevil	Farmington Devon	Injured lawns in late June and July.
Lucanus capreolus	Stag beetle	Middletown	Adults from lawn
Phyllophaga hirticula	May or June beetles	Old Lyme	On tree roses, June 3
Phyllophaga tristis	White grubs	Old Lyme Woodbridge	Grubs in soil, May.
Phyllophaga sp.	White grubs	New Haven Woodbridge	Grubs in soil.
Popillia japonica	Japanese beetle	New Haven Norwich Old Saybrook Ridgefield Torrington	Adult, September 8. Severe infestation found at Ridgefield.
Serica sp.	White grubs	Hamden	Grubs in soil, May 19.
Sphecius speciosus	Cicada killer	Hartford Old Lyme	Adults, July 31 and October 8.
Tibicen chloromera	Cicada	New Haven Hartford	Adult and pupa in soil.
——	Black noctuid larvae	Greenwich	Injuring lawns. Adults not reared.

Stored Grain and Household Insects

Scientific name	Common name	Locality	Remarks
Alobates pennsylvanicus	A Tenebrionid beetle	Shelton	In residence.
Anthrenus scrophulariae	Carpet beetle	Greenwich New Haven Norwalk	Common in dwelling houses.
Attagenus piceus	Black carpet beetle	Hartford New Haven West Haven	Common in dwelling houses.
Blattella germanica	German cockroach	Plantsville	Infesting residence.
Brachyrhinus ovatus	Strawberry crown girdler	West Haven	Probably emerged from soil in flower pots.
Bryobia praetiosa	Clover mite	New Haven	Newly-hatched mites crawling in house.
Cimex lectularius	Bedbug	Darien New London	From pigeon nest. Infesting a residence.
Cyllene caryae	Hickory borer	South Manchester	Probably emerged from fire wood.
Dermestes lardarius	Larder beetle	Branford	Several adults in house.
Dermestes nidum	A Dermestid beetle	South Norwalk	Two adults in house.
Hylesinus aculeatus	Ash timber beetle	New Haven	Probably emerged from fire wood.
Monomorium pharaonis	Pharaoh's ant	Hartford	Infesting tobacco warehouse.
Mylabris quadrimaculatus	Four-spotted bean weevil	Newington	Infesting seed of cowpea.
Oryzaephilus surinamensis	Saw-toothed grain beetle	Hartford South Norwalk	Infests stored cereals
Periplaneta americana	American cockroach	New Haven	Infesting residence.
Phymatodes variabilis	Variable oak borer	Hartford	Probably emerged from fire wood.

Stored Grain and Household Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Sitodrepa panicea	Drug store beetle	Bridgeport	Infests dried plant products.
Tenebrio molitor	Yellow meal worm	New Have	In stored peat moss
Tenebrioides corticalis	A Tenebrionid beetle	New Haven	Injuring stored seed corn.
Tineola biselliella	Webbing clothes moth	Derby New Haven	Infesting feather beds. Adult in residence.

Beneficial Insects

Acholla multispinosa	An assassin bug	Hamden	Predaceous bug on willows.
Chilocorus bivulnerus	Twice-stabbed lady-beetle	Hamden	On pine. Feeds upon scale insects.
Hippodamia convergens	Convergent lady-beetle	New Haven	One adult. Feeds upon aphids.
Tenodera sinensis	Chinese praying mantid	South Norwalk	Feeds on other insects. Common in southwest corner of state.

Miscellaneous Insects

Aëdes atropalpus	A mosquito	Darien	Three adults, August 4.
Aëdes sollicitans	Salt marsh mosquito	Darien Madison	Adult, August 4. Two adults, September 14.
Alaus oculatus	Eyed elater	Bridgeport Hartford	Adults, June 4 and 5.
Basilarchia archippus	Viceroy	Rockville	Adult, August 18.
Basilarchia astyanax	Red-spotted purple	Rockville	Adult, August 18.
Basilona imperialis	Imperial moth	New Haven	Larva.
Calligraphus similis	A leaf beetle	New Haven	Adult.
Cerastipsocus leidyi	Psocus—bark louse	Long Hill	On bark of tree.
Cercyonis alope	Blue-eyed grayling	North Branford	Adult, August 4.
Chauliodes pecticornis	A fish fly	Hartford	One adult.

Miscellaneous Insects—*(Continued)*

Scientific name	Common name	Locality	Remarks
Chelymorpha cassidea	A tortoise beetle	North Haven	Adults, July 30.
Chiridia guttata	A tortoise beetle	North Haven	Adults, July 30
Chrysochus auratus	Green-gold leaf beetle	Hamden	Adults, June 29 and August 4.
Citheronia regalis	Regal moth	Guilford Stonington	Larva on black walnut, August 14. Adult, July 13.
Corydalis cornuta	Hellgrammite	Bridgeport Hartford Stonington West Hartford Wethersfield	Adults attracted to electric lights in July.
Deilephila lineata	White-lined sphinx	New Haven	Larva, July 15.
Deilophonota ello	A sphinx moth	Hartford	Larva, September 3 Rare.
Enchenopa binotata	Two-marked tree hopper	Danielson Hamden Norfolk	On bittersweet, acacia and viburnum.
Gryllus assimilis	Common cricket	Long Hill New Haven	Injuring strawberry plants, October 8.
Laertias philenor	Pipe-vine swallow-tail	Danielson	Larvae, September 8.
Lucilia sericata	A scavenger fly	Noank	Many flies killed by fungus stuck on twigs and leaves.
Mansonia perturbans	A mosquito	Madison	Adult, September 14.
Papilio glaucus form *turnus*	Tiger swallow-tail	Bristol Hartford New Haven Plantsville Stratford	Larva, September 5. Larvae, September 14. Larva, August 7. Larva, September 4. Cocoon, September 9.
Papilio troilus	Green swallow-tail	Torrington	Larva, September 3.
Pelecinus polyturator	A parasitic four-winged fly	Middletown	Adult female, August 19.
Philosamia cynthia	Cynthia moth	New Haven	Several cocoons.

Miscellaneous Insects—*(Concluded)*

Scientific name	Common name	Locality	Remarks
Phytonomus meles	A weevil	Hartford	Ten adults from haymow.
Prionus laticollis	Broad-horned prionus	West Haven	Two adults.
Samia cecropia	Cecropia moth	East Woodstock Killingworth North Woodbury	Half-grown larvae on apple. Adult on lawn. Two parasitized larvae.
Tetraopes tetraophthalmus	Milkweed beetle	Hamden	Adults.
Tibicen canicularis	Cicada	Windsor	Adult, September 3.
Tremex columba	Pigeon horntail	New Haven	Adult, August 20
Tropaea luna	Luna moth	Orange	Adult, July 14.
Xylocopa virginica	Carpenter bee	Rocky Hill	Nest in piece of lumber, October.

Conference of Connecticut Entomologists

The eighth annual conference of entomologists working in Connecticut was held at the Station, October 30, 1931. The guest speakers were Professor Charles P. Alexander, of the Massachusetts State College, Amherst, Mass., and Mr. A. F. Burgess, of the Plant Quarantine and Control Administration, in charge of Gipsy Moth Control. Sixty-one persons were present. The following program was carried out without substitution:

GREETING, Director William L. Slate, New Haven

SHADE TREE DEFOLIATION, Dr. E. P. Felt, Stamford

ENTOMOLOGICAL FEATURES OF THE SEASON OF 1931, Dr. W. E. Britton, New Haven

OBSERVATIONS ON THE CHINESE MANTID, S. W. Bromley, Stamford

COLLECTING DIPTERA IN CONNECTICUT, Prof. Charles P. Alexander, Amherst, Mass.

THE GIPSY MOTH PROBLEM, A. F. Burgess, Greenfield, Mass.

MOTION PICTURES: LIFE STORY OF THE CECROPIA MOTH, Prof. J. A. Manter, Storrs

GENERAL CONDITIONS ON EUROPEAN CORN BORER AND JAPANESE BEETLE IN THE UNITED STATES, L. H. Worthley, South Norwalk

THE JAPANESE BEETLE IN CONNECTICUT, J. Peter Johnson, Shelton

SOME NOTES ON LESSER-COMMON BUTTERFLIES OF CONNECTICUT, Charles Rufus Harte, New Haven

THE MEXICAN BEAN BEETLE IN CONNECTICUT, Neely Turner, New Haven

NOTES ON THE ARTIFICIAL PROPAGATION OF *Macrocentrus ancylivora*, Dr. Philip Garman, New Haven

CABBAGE MAGGOT CONTROL, Dr. R. B. Friend, New Haven

Mr. Botsford then showed a motion picture film of mosquito ditching operations and explained the progress of the work in Connecticut. Remarks were made by Harold L. Bailey, of Vermont, Prof. A. E. Stene, of Rhode Island, and C. W. Collins, of Melrose Highlands, Mass.

INSPECTION OF NURSERIES IN 1931

W. E. Britton and M. P. Zappe

The annual inspection of nurseries is provided for in Sections 2136 to 2140 of the General Statutes, revision of 1930. In 1931 this inspection was commenced July 1, and completed in October, except for a few nurseries that registered after July 1. This work was in charge of Mr. Zappe, who was assisted by A. F. Clark, W. T. Rowe, and R. J. Walker. In a few special cases, inspections were made by R. C. Botsford, A. A. Dunlap, B. H. Walden, E. M. Stoddard and W. E. Britton.

In 32 nurseries, no pests were found. Altogether, about 155 different insects and 87 plant diseases were found in the nurseries. It is unnecessary to mention all of the pests here, but some of the more important and more abundant pests with the number of nurseries infested by each are indicated in the following table:

Nine-Year Record of Certain Nursery Pests

	1923	1924	1925	1926	1927	1928	1929	1930	1931
Oyster-shell scale	42	44	38	39	45	57	78	86	73
San José scale	20	32	32	19	16	30	22	8	11
Spruce gall aphids[1]	28	40	27	42	82	120	147	99	124
White pine weevil	17	5	5	8	17	19	37	66	74
Poplar canker	34	25	34	32	39	35	37	35	23
Pine blister rust (on *Ribes*)	6	8	7	9	9	5	7	7	13
Nurseries uninfested ..	32	33	34	46	37	18	13	18	32
Number of nurseries ..	106	116	151	162	191	228	266	302	327

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, and the list for 1931 contains 327 names with a total acreage of 3,998 acres. Of the 327 separate nurseries in the state, a classification on account of size may be made as follows:

Area	Number	Percentage
50 acres or more	19	6
10 acres to 50 acres	38	12
5 acres to 10 acres	32	10
2 acres to 5 acres	73	22
1 acre or less	165	50
	327	100

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

The list of Connecticut nurserymen receiving certificates in 1931 contains 327 names, 13 of which were registered as new after the annual inspection had been made and therefore had to be inspected and certified twice, once during the winter or spring and again in the late summer or fall. Nine nursery firms holding certificates in 1930 failed to register on or before July 1, as provided in Section 2127 of the General Statutes, revision of 1930. The cost of inspection amounted to $80, and was collected and turned over to the Treasurer of the Station on December 8, 1931, to be deposited with the State Treasurer. This cost would have been

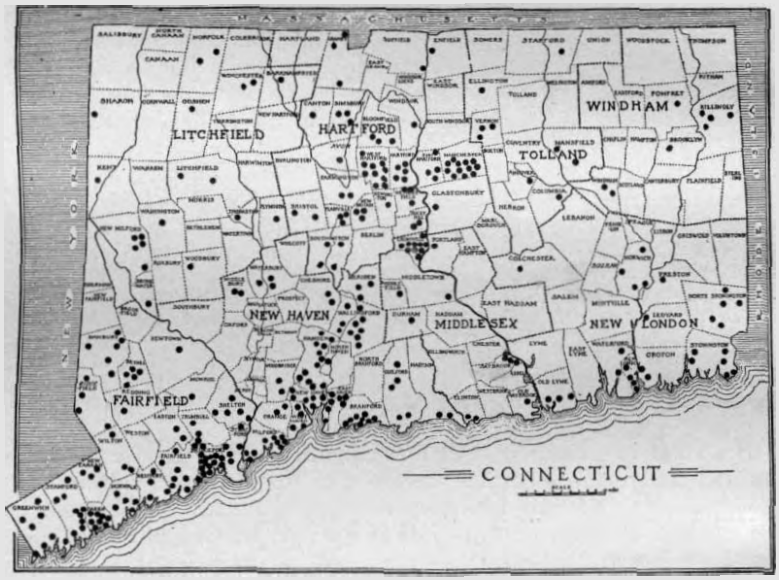

FIGURE 44. Map of Connecticut showing location of the 327 nurseries inspected in 1931.

somewhat greater, if a special trip to each nursery had been made, but as several nurseries are usually inspected on the same trip the expense is proportioned between them.

The total area of nurseries in Connecticut in 1931 is about 3,998 acres, an increase of 343 acres over 1930. These figures are in part estimates and are not absolutely exact. They 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 of acres are given the next whole number is recorded. The distribution of these nurseries is shown on the

map in Figure 44. The list of certified nurseries now contains 327 names, 38 new nurseries have been added, and 12 have discontinued business during the year. Twenty-three nurseries on last year's list are now included under different firm names. The nursery firms granted certificates in 1931 are as follows:

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931

Name of firm	Address	Acreage	Certificate issued	Number certificate
Abeling, R. W.	Torrington	1	Sept. 10	1540
Adamec, George	Foxon, East Haven	1	Oct. 20	1657
Albrecht's Nursery	Shelton	1	Sept. 29	1598
Aldrich, Edward	Guilford	1	May 15	1387
Alius, Adolf	Stamford	1	Dec. 17	1708
Allen, Henry L.	North Stonington	1	Aug. 3	1446
Amclunxen & DeWyn	Yalesville	4	Aug. 26	1499
Ampelopsis Nurseries	Groton	1	Aug. 3	1438
Andover Gardens	Andover	2	July 31	1422
Anstett, Louis	Norfolk	1	Sept. 10	1542
Artistree Nursery	Branford	2	Nov. 12	1684
Austin, M. E.	Clinton	1	Aug. 31	1519
Barnes Bros. Nursery Co., Inc.	Yalesville	195	Aug. 10	1458
Barnes Eastern Nurseries	Wallingford	15	Sept. 15	1555
Barnes Nursery & Orchard Co.	Wallingford	50	Oct. 13	1636
Barry, Joseph E.	Mount Carmel	1	Sept. 16	1567
Bartollota, S.	Cromwell	1	Aug. 15	1478
Barton Nursery	Hamden	1	Oct. 3	1616
Beattie, W. H.	New Haven	1	Oct. 20	1656
Beaudry-Wood	Redding	1	Sept. 23	1585
Bedford Gardens	Plainville	1	July 29	1413
Belltown Nurseries	Stamford	2	Sept. 25	1593
Benbow, Abram	Norfolk	1	Sept. 10	1541
Bertana, Louis	Glenbrook	2	Oct. 20	1654
Bertolf Bros., Inc.	Greenwich	45	Aug. 28	1507
Boggini, Louis (2)	Manchester	1	Oct. 1	1607
Bonnie Brook Gardens	Rowayton	2	Aug. 15	1477
Booy, H. W.	Yalesville	4	July 21	1397
Botsford, R. C.	New Haven	1	Oct. 14	1641
Brainard Nursery and Seed Co.	Thompsonville	20	July 30	1418
Braley & Co., S. A.	Burnside	2	July 27	1409
Brandriff's Rock & Perennial Gardens	Branford	1	Oct. 29	1674
Branford Nurseries	Branford	4	Oct. 31	1675
Bretschneider, A.	Danielson	1	Aug. 11	1460
Bridgeport Hydraulic Co.	Bridgeport	50	Oct. 21	1662
Brimfield Gardens Nursery	Wethersfield	10	Sept. 12	1550
Bristol Nurseries, Inc.	Bristol	50	Aug. 13	1470
Brooklawn Conservatories, Inc.	Bridgeport	1	Oct. 23	1667
Brooklawn Nursery	Bridgeport	2	Oct. 15	1645
Brouwer's Nurseries	New London	20	Aug. 14	1473

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
Brown, E. M.	Hartford	15	Aug. 31	1514
Bruce Nurseries	Danielson	1	July 31	1429
Bulpitt, Henry F.	Darien	4	Sept. 14	1554
Buntings' Nurseries, Inc.[1]	Groton	2	Aug. 17	1482
Burke the Florist	Rockville	1	July 21	1402
Burr, Morris L.	Westport	1	Sept. 24	1586
Burr & Co., Inc., C. R.	Manchester	500	July 30	1416
Burroughs, Thomas E.	Deep River	1	Aug. 3	1437
Burwell, Ellsworth E.	New Haven	1	Oct. 14	1643
Byram Evergreen Nursery	East Port Chester	1	Sept. 25	1591
Calvanese, John	Southington	1	Sept. 2	1522
Candee, H.	Wethersfield	7	Oct. 15	1646
Cant, Alexander	Springdale	1	Sept. 25	1590
Cardarelli, E. J.	Cromwell	5	Sept. 14	1552
Carey, Alice L.	Cheshire	1	Sept. 16	1566
Cascio, Peter J.	West Hartford	1	Aug. 25	1495
Case, Mrs. Louis L.	Simsbury	1	Oct. 28	1671
Chippendale Nurseries	Old Lyme	2	Dec. 22	1711
City Line Florist (2)	Bridgeport	1	Oct. 6	1625
Clark, Raymond H.	Milford	2	July 20	1396
Clark, Wyllis S. (2)	New Canaan	2	Sept. 23	1583
Cleary, Arthur R.	Bethel	1	Sept. 5	1534
Clinton Nurseries	Clinton	75	Sept. 10	1538
Clyne Nursery Co.	Middlebury	6	Dec. 5	1702
Colchester Nursery, Inc. (2)	Colchester	1	July 31	1423
Conine Nursery Co.	Stratford	75	July 31	1419
Conn. Agr. Col. (Prof. S. P. Hollister)	Storrs	1	July 31	1424
Conn. Agr. Expt. Sta. (W. O. Filley, Forester)	New Haven	4	Nov. 30	1697
Conn. Forestry Nurseries	Deep River	10	Aug. 3	1436
Conn. State Highway Dept.	Hartford	12	Sept. 16	1564
Conn. Valley Nurseries	Manchester	10	July 21	1400
Cooper's	Bridgeport	1	Dec. 24	1712
Corrigan's West Haven Nurseries	West Haven	1	Oct. 2	1610
Couture, E. R.	Westport	2	Oct. 6	1624
Cragholme Nurseries, Inc.	Greenwich	5	Aug. 25	1493
Cromie, G. A.	New Haven	2	Nov. 7	1679
Cronamere Nurseries	Greens Farms	1	Oct. 14	1639
Culver, W. B.	Suffield	1	Aug. 8	1457
Curtiss, C. F.	Plantsville	2	Dec. 22	1710
Dallas, Inc., Alexander	Waterbury	2	Nov. 13	1689
Damen, Peter J.[2]	Foxon	2	Oct. 31	1676
Darien Nurseries	Darien	6	Aug. 11	1461

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

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
Dawson, Florist	Willimantic	2	Sept. 14	1553
Daybreak Nurseries, Inc.	Westport	6	Dec. 8	1704
Dearden Brothers	East Hartford	1	Oct. 21	1661
DeCerbo, Meyer E.	Woodmont	1	Oct. 2	1612
DeMars, F. H.	Winsted	1	Sept. 18	1571
Devon Nursery	Devon	1	Aug. 22	1489
Dingwall, Joseph N.	West Haven	1	June 2	1389
Doebeli, Charles A.	Bridgeport	1	Sept. 15	1560
Dondi, Augusto	Hamden	1	Nov. 21	1694
Dougherty's Nurseries	Yalesville	1	Aug. 26	1500
Dowd, Inc., F. C.	Madison	1	Dec. 11	1707
Drescher, John	Sharon	1	Sept. 30	1602
Dunlap's Hydrangea Nursery	Cromwell	3	Aug. 7	1455
Dunn, James F.	Stamford	3	Oct. 20	1653
Eager, E. M.	Bridgeport	1	Sept. 15	1558
East Haven Nursery	East Haven	1	Oct. 20	1658
East Rock Nursery Co.	New Haven	1	Sept. 29	1597
Eells' Sons	Manchester	1	July 21	1401
Elfgren & Sons, I. P.	East Killingly	2	July 31	1430
Ellington Nurseries	Ellington	1	July 21	1398
Elm City Nursery Co., Woodmont Nurseries, Inc.	New Haven	140	Sept. 25	1588
Elmgren, C. J.	Cromwell	1	Aug. 21	1486
Elm Grove Cemetery Association	Mystic	1	Oct. 2	1613
Evergreen Nursery Co., The	Wilton	25	July 20	1395
Eyberse & Sons, John	Norwich	1	July 31	1421
Farmington Valley Nursery	Avon	5	Sept. 10	1543
Fletcher, Walter G.	Hamden	15	Nov. 30	1696
Flower City Rose Co.	Manchester	20	Aug. 3	1435
Fraser's Nurseries & Dahlia Gardens	Willimantic	3	Aug. 19	1484
Galligan, Clarence W.	New Haven	1	Oct. 21	1659
Gallup, Amos M.	Pawcatuck	1	Aug. 3	1439
Gardner's Nurseries	Cromwell	200	Aug. 18	1483
Geduldig's Greenhouses	Norwich	3	Aug. 15	1476
Gilbert, Henry G.	Danielson	2	July 31	1428
Giuliano, John S.	Hartford	1	Sept. 9	1535
Glastonbury Gardens	Glastonbury	2	Aug. 12	1468
Glen Terrace Nurseries	Hamden	35	Oct. 14	1638
Godfrey's Stratfield Nurseries	Bridgeport	40	Dec. 7	1703
Golden Hill Nurseries	Shelton	2	Oct. 7	1628
Goodwin Nurseries	Bloomfield	7	Sept. 2	1525
Goshen Nurseries	Goshen	5	Sept. 30	1604
Griffin & Schmidt, Inc.	West Hartford	2	Oct. 3	1618
Griswold, George	Old Lyme	1	Sept. 23	1579
Gunn, Mrs. Charles	Kent	1	Oct. 15	1647

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
Haas, Florist, Emil	Devon	1	July 20	1394
Hall, Henry A. L.	West Haven	1	Oct. 5	1621
Hamden Nursery	Hamden	1	Sept. 24	1587
Hammonassett Gardens	Madison	6	Aug. 31	1516
Hansen, Peter	Fairfield	5	Oct. 16	1649
Harrington, Walter P.	North Granby	1	Nov. 13	1690
Hawes, Frank M.	West Hartford	1	Sept. 10	1544
Hearn, Thomas H.	Washington	3	Oct. 29	1672
Heath & Co.	Manchester	10	July 21	1399
Hendrix, Mrs. Edwin A.	New Milford	1	Aug. 11	1464
Henninger, Christ.	New Britain	1	Sept. 2	1523
Hettinger, J. O.	Manchester	1	Aug. 31	1509
Hillcrest Gardens	Woodbridge	2	Aug. 31	1517
Hilliard, H. J.	Sound View	1	Sept. 4	1529
Hinkley Hill Nursery	Stonington	1	Aug. 14	1474
Hiti Nurseries	Pomfret Center	12	Aug. 5	1449
Holcomb, H. Parks	Winsted	2	Sept. 11	1545
Holcomb, Irving	Simsbury	1	July 31	1420
Holdridge & Son, S. E.	Norwich	4	July 31	1427
Hopeville Gardens	Waterbury	2	Aug. 31	1520
Horan, James F.	Hartford	2	Oct. 3	1615
Horan & Son, James	Bridgeport	1	Oct. 26	1669
Houston's Nurseries	Mansfield Depot	15	Oct. 7	1627
Hoyt, Charles E.	Danbury	9	Sept. 5	1533
Hoyt's Sons Co., Inc., Stephen	New Canaan	500	Aug. 1	1431
Innes, William	Milford	2	July 29	1412
Intravaia & Sons, J.	Middletown	1	Oct. 13	1635
Jennings, George S.	Southport	2	Oct. 6	1623
Johnson, Harry L.	South Meriden	1	Sept. 19	1573
Johnson, Tom	Stratford	1	Sept. 15	1562
Judd, T. H.	Danbury	1	Dec. 4	1698
Kast, Alfred A.	Yalesville	1	Sept. 9	1536
Kavanagh, M. V. (2)	North Stonington	1	Sept. 3	1528
Kelley & Son, James J.	New Canaan	6	Aug. 22	1488
Keystone Nurseries	Danbury	1	Oct. 1	1606
Knapp's Perennial Gardens	Plainville	1	July 29	1414
Kosty's Perennial Garden Nurseries	Rockville	1	May 15	1388
Langstroth Conifer Nursery	Danbury	6	Sept. 26	1596
Lawrence Greenhouses (2)	Branford	1	Dec. 10	1706
Laviola, Louis	New Haven	1	Oct. 29	1673
Leghorn Nurseries	Cromwell	17	Aug. 24	1491
Lewis & Valentine, Inc.	Darien	10	Aug. 26	1504
Lockwood, Percy A.	Shelton	1	Sept. 29	1600
Loring Nursery Co., The Robert	Yalesville	1	Aug. 26	1502
Luckner, Jr., Wm.	Stepney	1	Nov. 13	1688
Lynch, Mrs. John H.	Ridgefield	4	Sept. 17	1570

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
Main, Walter G.	North Stonington	1	Aug. 3	1443
Mallett Co., Geo. A.	Bridgeport	5	Sept. 12	1547
Maplehurst Flower Gardens	Fairfield	1	Oct. 21	1664
Maplewood Nursery Co.	Norwich	2	Oct. 9	1633
Marigold Farm Nursery	New Canaan	12	Aug. 26	1503
Mason, Warren S.	Farmington	1	Nov. 28	1695
Mather Estate, Stephen T.	Darien	1	Sept. 12	1551
Mayapple Nursery	Stamford	1	Nov. 6	1678
McCarthy, John P.	Danbury	1	Sept. 23	1578
McConville, John	Manchester	2	July 21	1407
Meachen, Mrs. George C.	Stratford	1	Sept. 15	1563
Meier, A. R.	West Hartford	1	Aug. 5	1450
Merwin Lane Nursery	East Norwalk	3	Aug. 25	1494
Meyer, Carl H. H.	Riverside	10	Aug. 4	1448
Meyer Nursery, Ludwig	Bridgeport	4	Oct. 13	1637
Middeleer, Inc.	Darien	25	Oct. 6	1622
Miliano, S. (2)	Woodmont	1	Oct. 2	1611
Millane Nurseries & Tree Experts Co., Inc.	Cromwell	50	Aug. 28	1508
Mill River Nursery	Fairfield	10	Aug. 31	1513
Millstone Garden	Terryville	1	Aug. 5	1452
Milton Flower Farm	Litchfield	1	Sept. 19	1575
Minge, G. H.	Rocky Hill	1	Aug. 15	1479
Montgomery Evergreen Nursery, Inc.	Cos Cob	3	Sept. 25	1594
Moraio Brothers	Stamford	5	Nov. 12	1687
Morgan, Wm. F.	North Stonington	2	Aug. 3	1442
Mountain Farm Nursery	West Hartford	2	Sept. 23	1580
Mount Airy Gardens	Stamford	1	Oct. 20	1655
Mount Carmel Nursery	Mount Carmel	1	Oct. 3	1617
Nelson Landscape & Nursery Service (2)	Bridgeport	1	Sept. 15	1557
New Britain Board of Water Commissioners	New Britain	50	Nov. 9	1682
Newell Nurseries, The	Hartford	5	Nov. 14	1691
New England Nurseries	New Canaan	1	Sept. 23	1584
New Haven Park Commission	New Haven	10	Aug. 3	1434
Newington Gardens & Nurseries	Newington	1	Sept. 12	1549
New London Cemetery Association	New London	1	Aug. 19	1485
New London County Nurseries	New London	5	Sept. 14	1556
New York, New Haven & Hartford R. R. Co.	Stamford	6	Sept. 25	1595
Nicolson & Thurston	Litchfield	1	Sept. 21	1576
North Avenue Nursery	Bridgeport	1	Sept. 29	1601
North-Eastern Forestry Company, The	Cheshire	60	July 20	1390

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
North Greenwich Nursery	Greenwich	1	Sept. 25	1592
Norwood Nursery	Hamden	1	Aug. 22	1490
Nyveldt, Albert	New London	1	Aug. 3	1447
Oakland Nurseries	Manchester	20	July 29	1415
Oakwood Novelty Gardens	East Hartford	1	Aug. 12	1467
Old House Gardens, The	Yalesville	1	Aug. 26	1501
Old Orchard Nursery	Norwalk	4	Sept. 23	1581
Ostergren, Herbert	Cromwell	2	Aug. 15	1480
Outpost Farm & Nursery Corp.	Ridgefield	200	Aug. 26	1506
Ouwerkerk, D. K.	Yalesville	10	Sept. 2	1524
Ox Yoke Farm Nurseries	Bridgeport	1	Nov. 7	1681
Panella, P.	Elmwood	1	Aug. 12	1469
Park Gardens	Bridgeport	1	Aug. 31	1515
Park Place Nurseries	Marion	2	Sept. 23	1577
Paton, William D.	Mount Carmel	2	Sept. 16	1569
Patterson, John	Old Saybrook	2	Sept. 18	1572
Pedersen, Anthon	Stamford	3	Sept. 25	1589
Peschko, Robert	Danbury	1	Aug. 11	1465
Pestretto, Frank	West Hartford	1	Aug. 31	1511
Pestretto, Salvatore	West Hartford	1	Oct. 15	1648
Pflomm, Charles W.	Bridgeport	1	Oct. 15	1644
Phelps & V. T. Hammer Co., The J. W.	Branford	3	Oct. 23	1666
Pierson, Inc., A. N.	Cromwell	250	Aug. 17	1481
Pinatello, Michael	East Hartford	3	Sept. 30	1605
Pinchbeck Bros., Inc.	Ridgefield	15	Oct. 28	1670
Pine Plains Greenhouse, Inc.	Norwich	1	Aug. 26	1505
Polish Orphanage Farm	New Britain	1	Sept. 16	1565
Pomeroy Blue Spruce Gardens	New Milford	5	Aug. 11	1463
Powers, R. J	Noroton	1	Dec. 8	1705
Pratt, Jr., George D.	Bridgewater	1	Sept. 30	1603
Prospect Nurseries, Inc.	Cromwell	25	Aug. 26	1496
Prudence Seymour Gardens	New Milford	1	Aug. 14	1472
Rabinak, Louis	Deep River	2	Aug. 7	1454
Race Brook Gardens, Inc.	Orange	1	July 20	1392
Rengerman's Garden	Granby	1	Sept. 4	1531
Reynold's Farms	South Norwalk	1	July 21	1404
Richmond, Gordon L.	New Milford	8	Aug. 15	1475
Rockfall Nursery Co.	Rockfall	110	Sept. 5	1532
Rose Hill Nurseries	Gildersleeve	3	Aug. 31	1512
Rosery Rest, The	Bridgeport	5	Sept. 19	1574
Sachem Forest Landscape Service	New Haven	1	Oct. 14	1642
Sage Bros. Company	North Woodbury	1	Aug. 31	1521
Sandelli's Greenhouse	New Britain	1	Oct. 6	1626

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
Sasco Hill Evergreen Nursery	Southport	1	July 27	1410
Saxe & Floto	Waterbury	1	Nov. 21	1693
Scarano Nursery	Groton	1	Aug. 11	1466
Schaeffer Bros.	Norwich	3	July 31	1426
Schleichert's Nurseries (2)	Bridgeport	1	Sept. 15	1559
Schneider, Godfrey	West Haven	1	Oct. 5	1620
Schulze, Charles T.	Bethel	5	Dec. 4	1699
Scott's Nurseries	Bloomfield	10	Nov. 21	1692
Selleck, Joel F. (2)	Bridgeport	1	Sept. 4	1530
Seltsam's Pequonnock Gardens	Bridgeport	1	Sept. 15	1561
Seymour's Hemlock Nursery	Riverton	2	Sept. 10	1546
Sierman, Inc., C. H.	Hartford	8	Sept. 9	1537
Silver City Nursery	Meriden	1	Sept. 2	1526
Silver Lane Nursery Co.	Burnside	1	July 28	1411
Silvermine Nurseries	Norwalk	1	July 23	1408
Simonsen, H. C.	Plainville	3	Oct. 14	1640
Smith & Son, Edward A. (2)	Mystic	1	Aug. 3	1445
Soltes Nursery, M. J.	Shelton	1	Sept. 12	1548
Southport Nursery	Southport	25	July 21	1405
South Wilton Nurseries	South Wilton	5	Aug. 13	1471
Spencer, W. L. L.	Columbia	1	July 31	1425
Spring Nurseries	Bristol	3	Aug. 10	1459
Stack, Garrett M.	Guilford	1	Nov. 12	1686
Stack, Sr., Thomas M.	New Milford	1	Aug. 11	1462
Stafford Conservatories	Stafford Springs	2	Aug. 7	1456
Stalzer & Son, John (2)	Brooklyn	1	Oct. 7	1629
Stannard, E. H.	Wilton	15	Oct. 19	1652
State of Conn. Forest Nursery (A. F. Hawes, Forester)	Hartford	6	Sept. 10	1539
State Street Nursery	New Haven	2	Sept. 16	1568
Steck, Jr., C. A.	Bethel	5	Oct. 13	1634
Steck, Charles A.	Newtown	10	Nov. 10	1683
Steck Nurseries, Inc.	Farmington	11	Dec. 21	1709
Steck, Sarah B.	Bethel	1	Oct. 9	1631
Stratford Rose Nurseries	Stratford	2	July 20	1391
Sunridge Nurseries	Greenwich	25	Aug. 9	1632
Sylvan Garden Nursery	Bridgeport	2	Oct. 19	1651
Thomas & Sons, Inc., W. D.	Hamden	2	Sept. 23	1582
Torizzo, P. A.	West Hartford	1	Aug. 26	1497
Tryon, Geo. W.	North Stonington	3	Aug. 3	1441
Van der Bom, F.	Bethel	5	Dec. 4	1700
Vanderbrook & Son, C. L.	Manchester	37	Aug. 3	1432
Van Wilgen Nurseries	Branford	12	Oct. 21	1663
Van Wilgen, William	Branford	1	Aug. 24	1492
Vasileff, Nicholas	Greenwich	4	Oct. 7	1630
Verkade's Nurseries	New London	50	Aug. 31	1510
Vernick Nurseries	Bridgeport	2	Oct. 19	1650

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1931—*(Continued)*

Name of firm	Address	Acreage	Certificate issued	Number certificate
Wallace Nursery	Wallingford	9	Aug. 26	1498
Waltermire, Wm. H.	Guilford	1	May 14	1386
Ward & Son, J. F.	Windsor	1	Aug. 3	1433
Water Bureau, Metropolitan District Commission of Hartford County	Hartford	50	Oct. 3	1614
Watrous, Arthur J.	Meriden	1	Sept. 2	1527
Wayside Farm Gardens	Thomaston	3	Aug. 5	1451
Westerly Nursery	Pawcatuck	1	Aug. 3	1444
Westville Nurseries, Inc.	New Haven	2	Oct. 23	1668
Wheeler, C. B.	Stonington	1	Aug. 3	1440
White Elm Nursery (2)	Talcottville	1	July 21	1403
Whittemore Co., J. H.	Naugatuck	3	Nov. 12	1685
Wilcox, Elmer E.	Guilford	1	Aug. 31	1518
Wild's Nursery, Henry	Greenwich and Norwalk	30	July 30	1417
Williams, Harry G.	Shelton	1	Sept. 29	1599
Wilmaco Gardens	Manchester	5	July 21	1406
Wilridge Nurseries	Ridgefield	3	Oct. 22	1665
Wilson & Co., Inc., C. E.	Manchester	125	Aug. 7	1453
Wilson's Tree Farms, Inc.	Cromwell	10	Aug. 21	1487
Woodbridge Nursery Co., Inc.	New Haven	4	Dec. 4	1701
Woodmont Fruit & Vegetable Farm	Woodmont	1	Oct. 2	1609
Woodmont Gardens	Woodmont	1	Oct. 2	1608
Woodruff, C. V.	Orange	1	July 20	1393
Wyllie, David	Whitneyville	1	Oct. 21	1660
Yale University School of Forestry Nursery	New Haven	1	Nov. 6	1677
Yale University, Landscape Department	New Haven	6	Nov. 7	1680
Zack Co., H. J.	Deep River	8	Oct. 5	1619
		3,998		

Duplicate Certificates to be Filed in Other States

Many states require that out-of-state nurserymen file inspection certificates of their nurseries, before stock can be shipped into these states. This office will furnish such duplicates if requested. During 1931, 224 such duplicates have been issued.

Registration of Nursery Dealers

According to the provisions of Section 2137 of the General Statutes of Connecticut, revision of 1930, all dealers in nursery stock must register with the State Entomologist on or before March 1 of each year and cite the chief sources of their nursery

stock. Dealer's permits are issued without charge and cover the remainder of the calendar year. All such permits expire on December 31. These permits are for use within the State of Connecticut and should not be attached to shipments sent into other states. During 1931, 127 permits were issued to dealers that registered. A list of such dealers is on file in the office of the State Entomologist, but is not printed in this Report.

Registration of Out-of-State Nurserymen

The law also provides that nurserymen in other states, before shipping stock into Connecticut, shall file with the State Entomologist a copy of a valid inspection certificate and receive a permit. Printed tags are not acceptable for this purpose but an exact duplicate signed by the officer issuing the certificate is required. The applicant is also required to fill out an application card, which is kept in the office files. On compliance with these requirements, a shipper's permit is issued without fee, enabling the applicant to ship nursery stock into Connecticut, for the period covered by the inspection certificate placed on file. During 1931, 243 such 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 need to transport trees, shrubs and plants, or wish to ship them to their friends. Nurserymen also may need to ship packages before receiving their regular certificates. Consequently, to enable such materials to be shipped, we have inspected them and furnished certificate tags. During 1931, 309 separate parcels of nursery stock have been inspected and certified.

Inspection of Narcissus Bulbs

Because 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 are dug for shipment. If found infested with bulb flies or eelworms, the bulbs must be treated before certificates are issued. During the year 43,000 such bulbs were inspected and certified.

Inspection of Laurel and Decorative Materials

Branches of mountain laurel and certain other shrubs as well as trees and vines are gathered in Connecticut, sometimes in large quantities, to be shipped into New York City. If gathered within the area quarantined on account of the gipsy moth, the material

must be inspected by Federal inspectors and if found clean is certified for shipment. Much of this material is gathered outside of the quarantined area, and yet needs to be inspected and certified before it can be shipped to New York City. During the year 309 such shipments were inspected and certified.

Special Certificates and Permits

Each year some form of special certificate or permit is requested for certain shipments. Some of these are consigned to foreign countries, which require a certificate based upon an inspection at packing time. Citizens and residents occasionally request permission to move living plant material from one point to another within the state. In 1931, no requests were received for the special inspection and certification of raspberry plants, because of mosaic and allied diseases, to meet the requirements of Michigan, Minnesota, New York, Vermont and Wisconsin. Consequently, no such inspections were made and no certificates issued. During the year, 148 special miscellaneous certificates and permits were issued.

Inspection of Shelled Seed Corn

Requests for certificates on shipments of shelled sweet corn and other seeds to be shipped into foreign countries were received from seed growers, and during the year 1,858 packages of such seeds were inspected and certified.

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 255 such permits were 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 quantity of nursery stock that entered Connecticut from foreign countries in 1931 was less than for the past 10 years, or about the same as in 1921. The reduction was perhaps due to prohibiting the entry of apple, pear, quince, and cherry stocks, all of which were permitted to enter until 1931. The past year the only fruit stocks coming into the state from abroad have been plum and raspberry seedlings. All other material has been rose stocks.

This material has been imported for propagation and it enters the country under specifications and permits of the Federal Plant Quarantine and Control Administration. At ports of entry it is released for transit to its destination where is it inspected by state inspectors.

The imported nursery stock entering Connecticut in 1930-1931 was inspected by Mr. Zappe, assisted at rush periods by Mr. McFarland, and consisted of 19 shipments containing 142 cases and 1,227,275 plants.

These 19 shipments were imported by eight different Connecticut firms. Of the 142 cases, 105 cases containing 911,075 plants were imported by one firm. Of the total number of shipments, 17 contained only rose stocks, and two had only fruit stocks.

Of this plant material inspected, 1,062,175 plants, or about 86 per cent, were rose stocks, and the remainder, 165,100 plants, or about 14 per cent, were fruit seedlings. Both rose and fruit seedlings were for propagation, and the quantity of each different variety is shown in the following table:

Kinds of Stock Imported

Rose stocks		
Rosa manetti	1,017,175	
" *multiflora*	28,000	
" *odorata*	15,000	
" *rugosa*	2,000	
		1,062,175
Fruit stocks		
Plum	165,000	
Raspberry	100	
		165,100
		1,227,275

Time of Arrival and Inspection

This imported nursery stock usually begins to arrive late in the fall, and continues well into the winter, but with the decreased quantity, both arrival and inspection of the stock covered a shorter period. Some importers ask for an immediate inspection, but others place the stock in storage and request that it be inspected on the installment plan, or as fast as they can use the stocks for grafting and propagation.

The time required to inspect this stock was equivalent to one man working 15 days, and this time together with travel and other necessary expenses amounted to nearly $230.

In addition to the material inspected and mentioned above, there were 17 shipments of new varieties of plants, and 22 shipments containing 737 pounds of tree seeds that were not inspected in Connecticut, but the plants were inspected and the seeds fumigated with carbon disulfide at Washington, D. C. Reports of the 19 shipments inspected were sent to the Plant Quarantine and Control Administration, Washington, D. C.

Results of Inspection

Of the 19 shipments inspected, 9 shipments, or 47 per cent, were found free from infestation, but in the other 10 shipments, or 53 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
10 SHIPMENTS INFESTED

Insects and other animals

Emphytus cinctus Linn. on manetti rose, 2 shipments.
Lepidopterous cocoon on fruit stock, 1 shipment.
Notolophus antiqua Linn. on manetti rose, 1 shipment.
Papilio pupa on fruit stock, 1 shipment.
Sowbugs in packing material, 1 shipment.
Spider's eggs on fruit stock, 1 shipment.
Sphinx moth pupa (dead) in packing material, 1 shipment.

Plant diseases

Crown gall on manetti rose, 1 shipment.

INSPECTION OF APIARIES IN 1931

W. E. Britton

The General Assembly of 1931 increased the appropriation for inspecting apiaries from $2,000 to $2,500 each year, or from $4,000 to $5,000 for the biennial period, and the increase became available July 1, 1931. Consequently, more apiaries and more colonies were inspected in 1931 than ever before in a single season. This inspection work was performed, as in preceding years, by H. W. Coley of Westport, and A. W. Yates of Hartford on a *per diem* basis. Mr. Coley inspects the four southern counties of Fairfield, New Haven, Middlesex and New London. Mr. Yates covers the four northern counties of Litchfield, Hartford, Tolland and Windham.

This inspection work in 1931 required 169 man days, and together with traveling expenses cost $2,264.65. Altogether, 1,232 apiaries, containing 10,678 colonies were inspected in 1931, as against 1,059 apiaries, containing 10,335 colonies inspected in 1930. These apiaries averaged 8.66 colonies each in 1931, and 9.76 each in 1930.

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 was begun in 1910.

Twenty-Two Year Record of Apiary Inspection in Connecticut

Year	Number apiaries	Number colonies	Average No. colonies per apiary	Average cost of inspection 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

TWENTY-TWO YEAR RECORD OF APIARY INSPECTION IN CONNECTICUT
(Continued)

Year	Number apiaries	Number colonies	Average No. colonies per apiary	Average cost of inspection Per apiary	Per colony
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
1931	1,232	10,678	8.66	1.83	.212

In 1931, apiaries were inspected in 157 towns as against 154 towns in 1930, and 141 towns in 1929. Inspections were made in 1931 in the following 13 towns not visited in 1930:

Fairfield County—Bridgeport and Brookfield; Hartford County—Marlborough; Middlesex County—Westbrook; New Haven County—Oxford, Seymour and West Haven; New London County—Bozrah and Ledyard; Tolland County—Bolton, Columbia, Hebron and Union.

On the other hand, in the following 10 towns visited in 1930, no inspections were made in 1931:

Middlesex County—Killingworth and Middlefield; Litchfield County—Cornwall, Kent, Plymouth and Warren; New London County—East Lyme; New Haven County—Southbury; Hartford County—Windsor Locks; Fairfield County—Ridgefield.

In the following two towns no inspections were made in either 1930 or 1931: New Haven County—Beacon Falls and Derby.

European Foul Brood

European foul brood was formerly by far the most prevalent of all diseases of the apiary, but has now become rather scarce. It is caused by a bacterial germ or organism known as *Bacillus pluton,* which infests and kills the young larvae or brood in the comb. The cell contents often have the odor of fermentation, but are not particularly offensive, and are not ropy or gelatinous. This disease usually appears in early summer, and the common treatment is to requeen with Italian queens, and to unite two or more weak colonies to make stronger ones.

Of the 1,232 apiaries and 10,678 colonies inspected in 1931, only one colony in one apiary in Preston, New London County, was found infested with European foul brood. This is equivalent to .0081 per cent of the apiaries and .000936 per cent of the colonies inspected for the season.

The following table shows a complete record of percentages of European foul brood in Connecticut since the system of inspections was 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	1931	.0081	.000936

American Foul Brood

American foul brood is now the most important disease of bees and is more prevalent than a few years ago. It is much more common and destructive than European foul brood. It is a disease of the young larvae or brood, caused by a bacterial organism or germ known as *Bacillus larvae,* which infests the larvae or brood in the cells, and kills them just before maturity. The symptoms often appear after the cells have been capped and after the brood has pupated. The cells are usually shrunken and the contents are ropy and stringy with a very offensive odor. The treatment is to shake the bees into clean hives, destroy the infected combs, and disinfect or destroy the old hives.

Of the 1,232 apiaries and 10,678 colonies inspected in 1931, 43 apiaries and 84 colonies were found infested with American foul brood. This is equivalent to 3.48 per cent of the apiaries and .0786 per cent of the colonies inspected in 1931.

The following table shows a complete record of American foul brood in Connecticut since the inspections first began in 1910:

RECORD OF AMERICAN FOUL BROOD

Year	Percentage of infestation		Year	Percentage of infestation	
	Apiaries	Colonies		Apiaries	Colonies
1910	0	0	1915	.8	.18
1911	0	0	1916	1.07	.15
1912	0	0	1917	.42	.17
1913	0	0	1918	1.01	.32
1914	1.07	.7	1919	3.	1.1

RECORD OF AMERICAN FOUL BROOD—*(Continued)*

Year	Percentage of infestation Apiaries	Colonies	Year	Percentage of infestation Apiaries	Colonies
1920	1.18	.25	1926	1.72	.29
1921	2.5	.56	1927	3.11	.70
1922	1.38	.27	1928	4.213	.98
1923	.985	.323	1929	4.64	1.2
1924	1.04	.22	1930	5.004	1.03
1925	3.26	.424	1931	3.48	.0786

In 1931, American foul brood was discovered in the following 29 towns: Fairfield County—Bethel and Greenwich; Hartford County—Berlin, Bristol, Hartland, Manchester, Newington, Simsbury and Southington; Middlesex County—Canton, Durham and Middletown; New Haven County—Ansonia, Cheshire, Madison, North Branford, North Haven, Prospect, Wallingford and Waterbury; New London County—Ledyard, Norwich and Stonington; Litchfield County—Bethlehem, Litchfield, Morris, Winchester and Woodbury; Windham County—Thompson. No American foul brood was found in Tolland County.

Statistics of Inspection

The statistics of apiary inspection by towns and counties are given on the following pages, with summary on page 538.

INSPECTION OF APIARIES, 1931

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European	Sacbrood
Fairfield County							
Bethel	3	1	23	2	2	0	0
Bridgeport	4	0	23	0	0	0	0
Brookfield	2	0	12	0	0	0	0
Danbury	7	0	118	0	0	0	0
Darien	3	0	82	0	0	0	0
Easton	3	0	78	0	0	0	0
Fairfield	6	0	101	0	0	0	0
Greenwich	18	2	226	6	6	0	0
Monroe	10	0	162	0	0	0	0
New Canaan	3	0	34	0	0	0	0
New Fairfield	7	0	53	0	0	0	0
Newtown	4	0	65	0	0	0	0
Norwalk	2	0	46	0	0	0	0
Redding	7	0	89	0	0	0	0
Shelton	1	0	14	0	0	0	0
Sherman	4	0	91	0	0	0	0
Stamford	18	0	138	0	0	0	0
Stratford	3	0	20	0	0	0	0
Trumbull	5	0	28	0	0	0	0
Weston	2	0	34	0	0	0	0
Westport	2	0	45	0	0	0	0
Wilton	8	0	153	0	0	0	0
	122	3	1,635	8	8	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European	Foul brood Sacbrood
New Haven County							
Ansonia	9	1	44	1	1	0	0
Bethany	2	0	18	0	0	0	0
Branford	3	0	8	0	0	0	0
Cheshire	9	2	76	5	5	0	0
East Haven	2	0	14	0	0	0	0
Guilford	6	0	41	0	0	0	0
Hamden	7	0	76	0	0	0	0
Madison	1	1	5	1	1	0	0
Meriden	10	0	137	0	0	0	0
Middlebury	7	0	85	0	0	0	0
Milford	2	0	12	0	0	0	0
Naugatuck	10	0	79	0	0	0	0
New Haven	1	0	4	0	0	0	0
North Branford	2	1	37	1	1	0	0
North Haven	5	2	59	3	3	0	0
Orange	7	0	67	0	0	0	0
Oxford	5	0	68	0	0	0	0
Prospect	3	1	43	3	3	0	0
Seymour	3	0	13	0	0	0	0
Wallingford	7	3	175	6	2	0	4
Waterbury	3	2	17	2	2	0	0
West Haven	2	0	19	0	0	0	0
Wolcott	3	0	17	0	0	0	0
Woodbridge	4	0	49	0	0	0	0
	113	13	1,163	22	18	0	4
Middlesex County							
Chester	8	0	44	0	0	0	0
Clinton	3	1	31	1	1	0	0
Cromwell	11	0	61	0	0	0	0
Durham	3	1	108	7	7	0	0
East Haddam	9	0	307	0	0	0	0
East Hampton	8	0	84	0	0	0	0
Essex	3	0	29	0	0	0	0
Haddam	4	0	53	0	0	0	0
Middletown	12	2	112	3	3	0	0
Old Saybrook	5	0	49	0	0	0	0
Portland	10	0	80	0	0	0	0
Saybrook	1	0	3	0	0	0	0
Westbrook	1	0	6	0	0	0	0
	78	4	967	11	11	0	0
New London County							
Bozrah	1	0	16	0	0	0	0
Colchester	14	0	119	0	0	0	0
Franklin	2	0	31	0	0	0	0
Griswold	4	0	83	0	0	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European	Sacbrood
New London County—*(Continued)*							
Groton	6	0	106	0	0	0	0
Lebanon	9	0	235	0	0	0	0
Ledyard	3	1	10	1	1	0	0
Lisbon	1	0	21	0	0	0	0
Lyme	1	0	40	0	0	0	0
Montville	7	0	57	0	0	0	0
New London	1	0	4	0	0	0	0
No. Stonington[1]	2	1	18	8	0	0	0
Norwich	9	1	549	1	1	0	0
Old Lyme	2	0	88	0	0	0	0
Preston	5	1	96	1	0	1	0
Salem	3	0	64	0	0	0	0
Sprague	3	0	6	0	0	0	0
Stonington	10	1	42	1	1	0	0
Voluntown	2	0	20	0	0	0	0
Waterford	5	0	62	0	0	0	0
	90	5	1,667	12	3	1	0
Litchfield County							
Barkhamsted	4	0	15	0	0	0	0
Bethlehem	14	1	102	1	1	0	0
Bridgewater	3	0	64	0	0	0	0
Canaan	3	0	23	0	0	0	0
Colebrook	6	0	27	0	0	0	0
Goshen	3	0	27	0	0	0	0
Harwinton	5	0	22	0	0	0	0
Litchfield	21	3	161	5	5	0	0
Morris	10	5	39	10	10	0	0
New Hartford	13	0	52	0	0	0	0
New Milford	15	0	144	0	0	0	0
Norfolk	7	0	32	0	0	0	0
North Canaan	7	0	113	0	0	0	0
Roxbury	4	0	26	0	0	0	0
Salisbury	8	0	82	0	0	0	0
Sharon	7	0	174	0	0	0	0
Thomaston	11	0	50	0	0	0	0
Torrington	20	0	89	0	0	0	0
Washington	5	0	18	0	0	0	0
Watertown	22	0	111	0	0	0	0
Winchester	10	2	41	2	2	0	0
Woodbury	10	1	110	2	2	0	0
	208	12	1,522	20	20	0	0

[1]Eight colonies with paralysis.

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European	Sacbrood
Hartford County							
Avon	12	0	59	0	0	0	0
Berlin	20	2	146	7	7	0	0
Bloomfield	15	0	207	0	0	0	0
Bristol	17	1	104	1	1	0	0
Burlington	9	0	48	0	0	0	0
Canton	12	0	103	0	0	0	0
East Granby	4	0	23	0	0	0	0
East Hartford	8	0	52	0	0	0	0
East Windsor	9	0	42	0	0	0	0
Enfield	6	0	46	0	0	0	0
Farmington	18	0	121	0	0	0	0
Glastonbury	20	0	120	0	0	0	0
Granby	7	0	73	0	0	0	0
Hartford	6	0	48	0	0	0	0
Hartland	4	1	65	1	1	0	0
Manchester	19	1	95	5	5	0	0
Marlborough	2	0	24	0	0	0	0
New Britain	15	0	113	0	0	0	0
Newington	17	1	83	2	2	0	0
Plainville	17	0	62	0	0	0	0
Rocky Hill	5	0	47	0	0	0	0
Simsbury	11	1	62	1	1	0	0
Southington	18	1	136	4	4	0	0
South Windsor	8	0	26	0	0	0	0
Suffield	13	0	79	0	0	0	0
West Hartford	10	0	49	0	0	0	0
Wethersfield	16	0	96	0	0	0	0
Windsor	21	0	155	0	0	0	0
	339	8	2,284	21	21	0	0
Tolland County							
Andover	4	0	7	0	0	0	0
Bolton	2	0	11	0	0	0	0
Columbia	7	0	29	0	0	0	0
Coventry	23	0	104	0	0	0	0
Ellington	13	0	74	0	0	0	0
Hebron	6	0	40	0	0	0	0
Mansfield	14	0	45	0	0	0	0
Somers	11	0	56	0	0	0	0
Stafford	12	0	43	0	0	0	0
Tolland	8	0	44	0	0	0	0
Union	2	0	4	0	0	0	0
Vernon	15	0	54	0	0	0	0
Willington	12	0	58	0	0	0	0
	129	0	569	0	0	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European	Foul brood Sacbrood
Windham County							
Ashford	9	0	64	0	0	0	0
Brooklyn	8	0	128	0	0	0	0
Canterbury	5	0	27	0	0	0	0
Chaplin	2	0	11	0	0	0	0
Eastford	7	0	16	0	0	0	0
Hampton	13	0	58	0	0	0	0
Killingly	16	0	63	0	0	0	0
Plainfield	17	0	67	0	0	0	0
Pomfret	9	0	64	0	0	0	0
Putnam	6	0	42	0	0	0	0
Scotland	5	0	23	0	0	0	0
Sterling	4	0	14	0	0	0	0
Thompson	17	1	99	3	3	0	0
Windham	18	0	83	0	0	0	0
Woodstock	17	0	112	0	0	0	0
	153	1	871	3	3	0	0

SUMMARY

County	Number towns	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul brood American	Foul brood European	Foul brood Sacbrood
Fairfield	22	122	3	1,635	8	8	0	0
New Haven	24	113	13	1,163	22	18	0	4
Middlesex	13	78	4	967	11	11	0	0
New London[1]	20	90	5	1,667	12	3	1	0
Litchfield	22	208	12	1,522	20	20	0	0
Hartford	28	339	8	2,284	21	21	0	0
Tolland	13	129	0	569	0	0	0	0
Windham	15	153	1	871	3	3	0	0
	157	1,232	46	10,678	97	84	1	4

	No. apiaries	No. colonies
Inspected	1,232	10,678
Infested with European foul brood	1	1
Percentage infested	.0081	.000936
Infested with American foul brood	43	84
Colonies treated		64
Colonies destroyed		20
Percentage infested	3.48	.0786
Infested with sacbrood	1	4
Infested with bee paralysis	1	8
Average number of colonies per apiary		8.66
Cost of inspection		$2,264.65
Average cost per apiary		1.83
Average cost per colony		.212

[1]One apiary with 8 colonies bee paralysis.

Financial Statement

RECEIPTS

Appropriation year ending June 30, 1931	$2,000.00
Balance on hand June 30, 1930	15.95
	$2,015.95

EXPENDITURES

Personal services	$894.00[1]
Travel	1,097.54
Printing	6.25
Total	$1,997.79
Balance on hand June 30, 1931	18.16[2]
Grand total	$2,015.95

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.

[1]In addition to this amount, $30 was paid out of Insect Pest Appropriation.
[2]Reverts to State Treasury.

During 1931, 1,070 apiaries containing 7,343 colonies were registered with the town clerks and the names and records of registration reported to the State Entomologist. Reports from 95 of the 169 towns were received on or before December 1, as required by law, and 74 were late. Reports from Cornwall, Eastford, East Granby, Monroe, Stamford and Waterford were not received until after January 1, but all were finally obtained after sending several notices and making telephone requests and personal calls. Of the total of 1,232 apiaries and 10,678 colonies inspected, 466 apiaries containing 4,624 colonies were registered later in the season of 1931. Those registered and reported constitute, therefore, nearly 87 per cent of the number of apiaries and 69 per cent of the colonies inspected during the season. However, less than half of the registered apiaries, or 43 per cent, and nearly two-thirds of the colonies, or 65 per cent, were inspected. Inspections were made of 766 apiaries and 6,054 colonies that were not registered with the town clerks in 1931.

No bees were registered in 1931, in the following seven towns: Windsor Locks in Hartford County; Canaan and Warren in Litchfield County; Westbrook in Middlesex County; Derby and Guilford in New Haven County; and Bozrah in New London County. No inspections were made in 1931 in 12 towns, including the three towns of Warren, Windsor Locks and Derby, mentioned above as having no registrations in 1931.

Number of Beekeepers in Connecticut

There has been considerable speculation regarding the number of apiaries and colonies of bees in Connecticut. In 1931, 1,232 apiaries and 10,678 colonies were inspected in 157 towns and 1,070 apiaries and 7,343 colonies were registered in 162 towns. After checking these figures carefully and deducting duplications, the following definite figures were obtained:

	Apiaries	Colonies
Inspected	1,232	10,678
Registered but not inspected	604	2,719
Total	1,836	13,397

Probably some apiaries were neither registered nor inspected in 1931, so in all probability there are 2,000 or more apiaries, containing 15,000 or more colonies, in Connecticut.

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.'"

GIPSY MOTH CONTROL IN CONNECTICUT IN 1931

JOHN T. ASHWORTH and W. E. BRITTON

This work has been continued as in former years, by the State Entomologist in cooperation with the Plant Quarantine and Control Administration of the United States Department of Agriculture. Federal men are especially concerned in preventing the further spread of the gipsy moth and their field of operation in Connecticut is along the western border of the infested area, and in the barrier zone as explained in the Report of this Station for 1930, pages 501 to 518.

State funds have not been adequate to cover all towns known to be infested, but work has been carried on in those towns where, on account of local abundance and the possibility of further spread, it has seemed best to expend the efforts of suppression. It is not safe to allow any town, district, or region to remain for many seasons unscouted, because the infestation may build up so that the moths will be extremely abundant. This not only endangers the vegetation in that locality, but it also greatly increases the danger of the insect being transported by motor vehicles and other agencies to points far distant. Where possible it is desirable to scout all towns at least every other year, and by alternating them this plan has in a measure been carried out. There is a section, however, in Windham County that has not been adequately scouted in several years, and this section should soon receive attention.

Apparently, no extensive wind spread has occurred and there has been no noticeable defoliation. In the scouting operations all egg-clusters discovered have been creosoted, and the more important infestations have been sprayed with lead arsenate. During the season 72 towns were scouted, 88 infestations discovered, 3,685 egg-clusters creosoted, and 5,277 larvae and pupae killed. In the scouting work the trees along 1,584 miles of roadway were examined and 151,061 acres of woodland scouted. In the caterpillar season, 31 infestations were sprayed, and 75,822 pounds or nearly 38 tons of lead arsenate used.

New Equipment and Replacements

The Buick six-cylinder sedan driven by Mr. Ashworth, had been run 85,000 miles and in June was turned in for a new Buick eight-cylinder sedan. The six-cylinder Chevrolet driven by Mr. McEvoy,

had gone over 49,000 miles when it was damaged in an accident, and it was exchanged for a new car of the same make and similar model.

Details of the Work by Counties and Towns

Windham County

In several former Reports, attention has been called to the fact that Windham County has not been covered each year because of insufficient appropriation. Windham was the only town in Windham County that was completely scouted. Late in the summer, observations indicated that infestations are building up in the woodlands along the borders adjoining Rhode Island and Massachusetts. No complete defoliation was discovered.

Windham: 2 infestations, 31 egg-clusters. Two colonies were discovered in Windham. One of 22 egg-clusters was in woodland in the northeast corner of the town, and the other of nine egg-clusters was in a large white oak just north of Windham Center.

New London County

Old Lyme was the only town in New London County that was completely scouted, but no infestations were found there. Late in June and in July former infestations were visited in some of the towns in search of caterpillars with results as follows: In Griswold, no infestation; in New London, 467 larvae and pupae; in Stonington, 404 larvae and pupae; in Voluntown, 93 larvae and pupae; and in Waterford, no infestation.

Norwich: 1 infestation, 137 egg-clusters. This colony was brought to our attention in early spring and the men scouted about one acre of brush and willow trees. Before the spraying crew reached this colony, some of the larvae had pupated, so no spraying was done. However, 1,102 larvae and pupae were destroyed.

Tolland County

Columbia: 1 infestation, 481 egg-clusters. Inspection of an old infestation along the Windham-Hebron highway revealed 481 old or hatched egg-clusters scattered over an area of about 30 acres, and altogether 1,616 larvae and pupae were destroyed.

Hebron: 6 infestations, 128 egg-clusters. Thirteen acres of woodland and 50 miles of roadside were scouted in Hebron. Five of the six colonies found were in the southwestern corner of the town, all within a radius of one and one-half miles. The largest

was in woodland and contained 65 egg-clusters; the next largest on an apple tree had 23 egg-clusters. The other four were small infestations.

Mansfield: In July a crew was sent into Mansfield to scout around old infestations and 445 larvae and pupae were found there and destroyed.

Middlesex County

The towns of Clinton and Durham were scouted and no trace of the gipsy moth found.

Haddam: 3 infestations, 27 egg-clusters. Of the 27 egg-clusters found in Haddam, 21 were on a white oak, a maple, and in a stone wall in that section of the town known as "Little City." Five old egg-clusters were found a half-mile south of this infestation, and about a mile farther south, one egg-cluster was found on a white oak. The large colony was sprayed July 5 by state men.

Middlefield: 3 infestations, 6 egg-clusters. Last year the woodland infestation on Beseck Mountain just west of the Lyman Orchards contained 262 egg-clusters. This year about 140 acres of woodland were scouted and only four new egg-clusters were discovered. One old and one new egg-cluster were found at the old infestation near the railroad, but spraying was thought unnecessary.

Middletown: 3 infestations, 13 egg-clusters. Three small colonies were discovered on Washington Street near the railroad crossing, one of nine egg-clusters, one of three egg-clusters, and a single egg-cluster. The first two colonies were sprayed in June by state men.

Hartford County

Berlin: 1 infestation, 24 egg-clusters. The old colony near the Newington line in the northeast corner of the town was re-infested this year, and 24 egg-clusters were creosoted. About two and one-half acres of woodland were sprayed on June 6 and it is hoped that this colony has now been eradicated.

Burlington: 1 infestation, 32 egg-clusters. The woodland scouting around the old infestation in the northwestern corner of the town revealed only eight new egg-clusters and 24 old ones where 605 egg-clusters were found last year. About 77 acres of woodland were scouted and in view of this gratifying decrease spraying was not attempted.

Canton: 13 infestations, 1,162 egg-clusters. Two state crews scouted considerable territory in Canton this year. The northern half of the town was completely examined from road to road, and altogether 1,259 acres of woodland and 73 miles of roadside were scouted. Here 13 colonies were discovered and 1,162 egg-clusters were creosoted. The largest infestation had 960 egg-clusters, scattered over pasture land in the northeast corner of the town. The next largest was one of 100 egg-clusters, in the northwest corner near the Hartland line. The other colonies were all small, most of them less than 10 egg-clusters each.

East Granby: 2 infestations, 36 egg-clusters. No scouting was done in East Granby this season except in woodland areas around the two old infestations. About 77 acres of woodland were scouted and 36 egg-clusters found, although 25 of these were old or hatched egg-clusters. Spraying was thought unnecessary.

Farmington: On July 23, men scouted the old infestations in the northeast corner of Farmington, and found and destroyed 13 larvae and pupae.

Granby: In Granby the only scouting was for larvae around last year's colonies. Late in July and early in August scouts found and destroyed 884 larvae and pupae.

Hartford: During March state men scouted 196 miles of roadway in Hartford, and found no trace of the gipsy moth.

Hartland: 3 infestations, 23 egg-clusters. Scouting was confined to territory around old infestations. Three small colonies were found, all near the eastern border of the town. Two of them had 10 egg-clusters each and the other only three. Seven of the 23 were old or hatched egg-clusters. About 17 acres of woodland were scouted and spraying was thought unnecessary.

Marlborough: State men scouted 57 miles of roadside and discovered no trace of the gipsy moth.

New Britain: 1 infestation, 1 egg-cluster. About 11 acres of woodland and 12 miles of roadside were scouted in the northwestern portion of New Britain and only one new egg-cluster was found. Spraying was deemed unnecessary.

Simsbury: 5 infestations, 135 egg-clusters. Scouting was limited to woodland areas. About 125 acres of woodland were scouted in five separate blocks, and five colonies were discovered. The largest, containing 101 egg-clusters, was in the 32 acres of woodland scouted back of the Ethel Walker School. This infestation was sprayed by state men early in July. The other four colonies were all small and spraying was thought unnecessary.

Southington: 1 infestation, 5 egg-clusters. The old infestation in the southeast corner of the town was re-infested, and five new egg-clusters were found scattered through the woodland. This was an appreciable decrease from last year when 102 egg-clusters were found at the same place. Spraying was done early in June by state men and it is hoped that the infestation has been eradicated.

Suffield: 2 infestations, 12 egg-clusters. About 31 acres of woodland were scouted by state men near the western border, and two small infestations, one of 11 egg-clusters and another of one egg-cluster, were discovered. The larger colony was situated near the southeast end of Lake Congamond. About two and one-half acres of woodland were sprayed July 2 by state men.

West Hartford: 1 infestation, 17 egg-clusters. There was another big decrease in the infestation on the east side of Talcott Mountain in West Hartford, where state men scouted about 79 acres of woodland and found only 17 egg-clusters, eight of which were old or hatched. In June, state men sprayed 44 acres of woodland at this colony and we hope to report next year that it is cleaned up.

Wethersfield: After about 22 miles of roadside had been scouted, spring rains came on and on account of high water the men were unable to reach the infestation on the river bank, so scouting was discontinued. We know, however, that the old infestation is re-infested, and further work will be necessary to eradicate it.

New Haven County

Branford: 4 infestations, 19 egg-clusters. The 1930 colony containing 430 egg-clusters, which covered a large area in the center of the village of Branford, was greatly reduced by spraying last year. Altogether, 19 egg-clusters were found in four small colonies. One colony of five egg-clusters was at 49 West Main Street; another of three egg-clusters was at 12 Bradley Street, a third colony of four egg-clusters was found at 42 Bradley Street, and the fourth was a single egg-cluster at 438 Harbor Street. State men sprayed all four of these colonies in June.

Meriden: 4 infestations, 35 egg-clusters. Approximately 163 acres of woodland were scouted by state men around the old infestations on West Peak. Four small colonies were discovered, containing altogether 35 egg-clusters. About 27 miles of roadside were scouted in the town. All four of these colonies were sprayed early in June by state men.

North Branford: 1 infestation, 95 egg-clusters. One colony of 95 egg-clusters was discovered by state men near the western

border of the town about half-way between the postoffices of Clintonville and Totoket. About 8.5 acres of woodland were sprayed early in June.

Wallingford: 1 infestation, 16 egg-clusters. Federal men scouted Wallingford this season and found the old colony re-infested. Here 16 egg-clusters were found and about 77 acres of woodland were sprayed by Federal men.

Other towns in New Haven County scouted and not found infested were: Cheshire, Madison, Waterbury and Wolcott, scouted by state men, and Beacon Falls, Hamden, Middlebury, Naugatuck, New Haven, Oxford, Prospect and Southbury, scouted by Federal men.

Litchfield County

Barkhamsted: 7 infestations, 251 egg-clusters. No roadside scouting was done in Barkhamsted, and all work was confined to woodland areas. About 165 acres were scouted in the eastern half of the town. Seven infestations were found, including one of 130 egg-clusters. State men sprayed the two largest infestations in June.

Canaan: 10 infestations, 595 egg-clusters. Federal men scouted only in woodland blocks, and covered 1,550 acres. Seven of the 10 colonies were in the southeast corner of the town in the Huntsville section. Only one was a large colony and contained 422 egg-clusters. The next largest colony was one of 28 egg-clusters in the same corner of the town. Much spraying was done by Federal men to eradicate the infestation. Altogether, 662 acres of woodland were sprayed and 20,902 pounds of lead arsenate were used.

Cornwall: 1 infestation, 41 egg-clusters. Government men scouted nearly 22,000 acres of woodland in Cornwall and found one colony of 41 egg-clusters about two miles south of Coltfoot Mountain near the Warren line. Here 291 acres were sprayed and nearly six tons of lead arsenate applied.

Harwinton: 2 infestations, 122 egg-clusters. Two colonies were found in Harwinton, one of 99 egg-clusters in woodland in the northeast corner of the town near the Burlington line, and the other of 23 egg-clusters on an apple tree near the Campville postoffice. At the first colony, about five acres of woodland were sprayed early in July by state men.

New Hartford: 1 infestation, 23 egg-clusters. State men scouted around last year's infestations and the adjacent area south of Bakersville postoffice. Here 23 egg-clusters were found, seven

of which were new. On July first, four acres of woodland were sprayed.

Norfolk: 1 infestation, 17 egg-clusters. One colony was found in Norfolk in woodland just west of Toby Pond near the Canaan line. Approximately 133 acres of woodland were sprayed by Federal men.

Salisbury: 5 infestations, 127 egg-clusters. The work here was limited to the woodland areas and five colonies were discovered. One of these had 83 egg-clusters, and was in the southeast part of the town about one mile from Falls Village. All five colonies and an area of about 284 acres were sprayed in June by Federal men.

Warren: 1 infestation, 56 egg-clusters. One colony was found in Warren on the east side of the ridge constituted by Rabbit and Town Hills. In woodland on the eastern margin of the town, 257 acres were sprayed by Federal men.

Washington: 1 infestation, 22 egg-clusters. Federal men scouted 8,708 acres in the town and discovered one colony of 22 egg-clusters near the Warren line. Here 42 acres of woodland were sprayed by the Federal forces.

Other towns in Litchfield County where scouting was done and nothing found were as follows: Bethlehem, Bridgewater, Colebrook, Morris, New Milford, North Canaan, Roxbury, Sharon, Watertown, Winchester and Woodbury. Federal men scouted all of these towns except Colebrook, which was scouted by state men.

Fairfield County

In Fairfield County this year only three towns were scouted: Brookfield, New Fairfield and Sherman. The work was done by Federal men and was confined to woodland areas. Approximately 16,269 acres of woodland were scouted and no trace of the gipsy moth was found.

Statistics of these infestations, together with scouting and treatment, are given in the following tables:

STATISTICS OF INFESTATIONS, 1930-1931

Towns	Infestations found	Egg-clusters creosoted	Colonies sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadways and woodland scouted[1]
Windham County						
Windham	2	31	0	0	6	72 miles
New London County						
Griswold[2]	0	0	0	0	0	
New London[2]	0	0	0	0	467	
Norwich	1	137	0	0	1102	1 acre
Old Lyme	0	0	0	0	0	41 miles
North Stonington[2]	0	0	0	0	13	
Stonington[2]	0	0	0	0	404	
Voluntown[2]	0	0	0	0	93	
Waterford[2]	0	0	0	0	0	
	1	137	0	0	2,079	41 miles 1 acre
Tolland County						
Columbia[2]	1	481	0	0	1616	30 acres
Hebron	6	128	0	0	6	13 acres 50 miles
Mansfield[2]	0	0	0	0	445	
	7	609	0	0	2,067	50 miles 43 acres
Middlesex County						
Clinton	0	0	0	0	0	49 miles
Durham	0	0	0	0	0	462 acres 59 miles
Haddam	3	27	1	25	0	111 miles
Middlefield	3	6	0	0	0	140 acres 37 miles
Middletown	3	13	2	175	0	60 miles
	9	46	3	200	0	316 miles 602 acres
Hartford County						
Berlin	1	24	1	100	0	6 miles 2 acres
Burlington	1	32	0	0	16	77 acres
Canton	13	1162	0	0	81	1259 acres 73 miles
East Granby	2	36	0	0	12	77 acres
Farmington[2]	0	0	0	0	13	
Granby[2]	0	0	0	0	884	
Hartford	0	0	0	0	0	196 miles
Hartland	3	23	0	0	33	17 acres
Marlborough	0	0	0	0	0	58 miles
New Britain	1	1	0	0	0	11 acres 12 miles

[1]Roadway recorded in miles, woodland in acres.
[2]Scouted around old infestations.

STATISTICS OF INFESTATIONS, 1930-1931

Towns	Infestations found	Egg-clusters creosoted	Colonies sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadways and woodland scouted[1]
Hartford County—*(Continued)*						
Southington	1	5	1	275	0	9 acres 13 miles
Simsbury	5	135	1	175	15	125 acres
Suffield	2	12	1	100	0	31 acres
West Hartford	1	17	1	1950	0	79 acres
Wethersfield	0	0	0	0	0	22 miles
	30	1,447	5	2,600	1,054	1,687 acres 380 miles
New Haven County						
Beacon Falls[2]	0	0	0	0	0	3756 acres
Branford[3]	4	19	4	150	0	65 miles
Cheshire[4]	0	0	0	0	0	9906 acres
Guilford[3]	0	0	0	0	0	126 miles 678 acres
Hamden[4]	0	0	0	0	0	9551 acres
Madison[3]	0	0	0	0	0	91 miles
Meriden	4	35	4	1750	0	27 miles 163 acres
Middlebury[4]	0	0	0	0	0	4534 acres
Naugatuck[4]	0	0	0	0	0	5255 acres
North Branford[3]	1	91	1	325	0	61 miles
North Haven[3]	0	0	0	0	0	63 miles
Oxford[4]	0	0	0	0	0	3296 acres
Prospect[4]	0	0	0	0	0	5870 acres
Southbury[4]	0	0	0	0	0	12724 acres
Wallingford[4]	1	16	1	2760	0	298 acres
Waterbury[3]	0	0	0	0	0	100 miles
Wolcott[2]	0	0	0	0	0	0
	10	161	10	4,985	0	56,031 acres 533 miles
Litchfield County						
Barkhamsted[3]	7	251	2	2100	27	165 acres
Bethlehem[4]	0	0	0	0	0	3387 acres
Bridgewater[4]	0	0	0	0	0	3015 acres
Canaan[4]	10	595		20902	0	1650 acres
Colebrook[2]	0	0	0	0	0	0
Cornwall[4]	1	41	1	12310	0	21978 acres
Harwinton[3]	2	122	1	275	44	81 miles
Morris[4]	0	0	0	0	0	3939 acres
New Hartford[3]	1	23	1	150	0	18 acres
New Milford[4]	0	0	0	0	0	10205 acres
New Canaan[4]	0	0	0	0	0	12 acres
Norfolk[4]	1	17	1	4594	0	480 acres
Roxbury[4]	0	0	0	0	0	6835 acres

[1]Roadway recorded in miles, woodland in acres.
[2]Scouted around old infestations.
[3]Scouted by state men.
[4]Scouted by Federal men.

STATISTICS OF INFESTATIONS, 1930-1931

Towns	Infestations found	Egg-clusters creosoted	Colonies sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadways and woodland scouted[1]
Litchfield County—*(Continued)*						
Salisbury	5	127	5	11091	0	430 acres
Sharon[4]	0	0	0	0	0	100 acres
Warren[4]	1	56	1	14655	0	532 acres
Washington[4]	1	22	1	1960	0	8708 acres
Watertown[4]	0	0	0	0	0	6176 acres
Winchester[3]	0	0	0	0	0	111 miles
Woodbury[4]	0	0	0	0	0	8798 acres
	29	1,254	13	68,037	71	76,428 acres 192 miles
Fairfield County						
Brookfield	0	0	0	0	0	3131 acres
New Fairfield	0	0	0	0	0	7023 acres
Sherman	0	0	0	0	0	6115 acres
	0	0	0	0	0	16,269 acres

SUMMARY OF STATISTICS

Counties	Number towns covered	Infestations found	Egg-clusters creosoted	Colonies sprayed	Poison used (lbs.)	Larvae and pupae killed	Roadways and woodland scouted[1]
Windham	1	2	31	0	0	6	72 miles
New London	8	1	137	0	0	2079	41 miles 1 acre
Tolland	3	7	609	0	0	2067	50 miles 43 acres
Middlesex	5	9	46	3	200	0	316 miles 602 acres
Hartford	15	30	1447	5	2600	1054	380 miles 1687 acres
New Haven	17	10	161	10	4985	0	533 miles 56031 acres
Litchfield	20	29	1254	13	68037	71	192 miles 76428 acres
Fairfield	3	0	0	0	0	0	16269 acres
	72	88	3,685	31	75,822	5,277	1,584 miles 151,061 acres

[1]Roadway recorded in miles, woodland in acres.
[3]Scouted by state men.
[4]Scouted by Federal men.

Quarantine

No changes affecting Connecticut have occurred in the state or Federal gipsy moth quarantines during the year. The areas under quarantine are shown in Figure 45. All nursery stock, trees, logs, cordwood, cut branches, brick and stones from quarry and field, are permitted to be moved out of the quarantined area after inspection and certification by a Federal inspector.

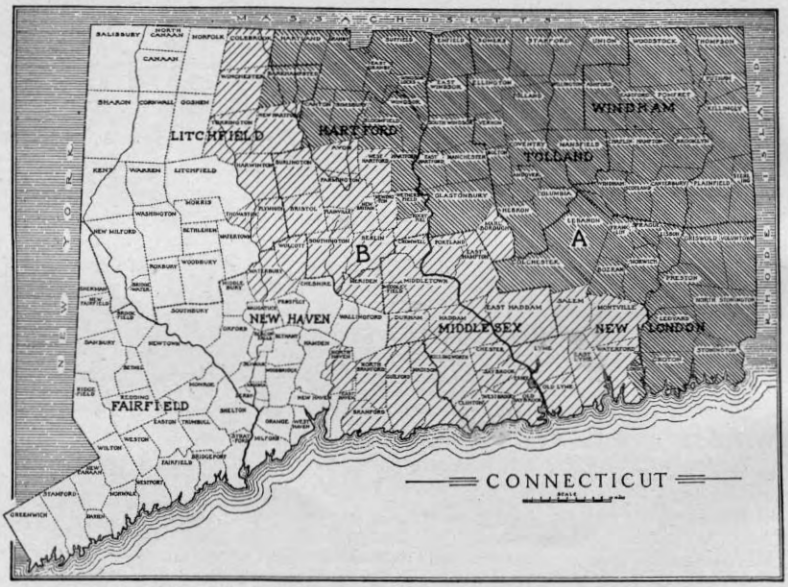

FIGURE 45. Map of Connecticut showing areas under quarantine on account of the gipsy moth. A, generally infested; B, lightly infested.

Financial Statement

RECEIPTS

Appropriation for year ending June 30, 1931	$50,000.00
Balance on hand June 30, 1930	902.07
	50,902.07

EXPENDITURES

Salaries		$ 4,844.00
Labor		37,279.02
Stationery and office supplies		66.45
Sundry supplies		
Insecticides	$ 900.00	
Small hardware	38.77	
Auto oil	79.60	1,018.37

Communication service, telephone		$57.25	
Travel expenses			
Outlying investigations	332.86		
Gasoline	1,235.25[1]	1,568.11	
Express		2.00	
Heat, light, water and power			
Fuel, coal	94.50		
Light, electricity	26.72	121.22	
Tools, machinery and appliances			
Motor vehicles	3,815.75		
Other equipment	371.23		
Auto repairs	448.17	4,635.15	
Rent of office, storehouse and auto storage		551.00	
Insurance		681.25	
Contingent		59.10	
Scientific supplies			
Chemicals	15.25		
Photographic supplies	3.25	18.50	
Balance on hand June 30, 1931			$ .65[2]
		$50,902.07	

EUROPEAN CORN BORER CONTROL, 1931

W. E. Britton and M. P. Zappe

The results of scouting in 1930 by Federal men to determine the westward spread of the European corn borer, *Pyrausta nubilalis* Hubn., showed that the extension of the two-generation infestation had been considerable and then occupied more than three-fourths of the towns in the state. Thus 63 new towns were placed under quarantine, including all of the shore towns from Branford westward to the New York line. Also the one-generation corn borer had spread in the northwestern corner of the state and five new towns were quarantined. There remained only 32 towns not under quarantine, and both these and the quarantined areas are shown in Figure 46.

In one of these towns, Danbury, a light infestation was discovered in a series of five fields containing about seven acres of silage corn, on the town farm in the northeastern outskirts of the city, and several miles distant from the nearest known infestation. The corn had been cut and placed in the silo. This process of course destroyed the borers in it, but as rather tall stubble remained in some of the fields, it was thought best to carry on clean-up operations instead of quarantining the town.

[1]In addition to this amount, $13.54 was paid out of Insect Pest Appropriation.
[2]Reverts to State Treasury.

Clean-Up Operations at Danbury

Two fields had been plowed, but there remained above ground much stubble that had to be gathered and burned. The stubble on the unplowed fields also had to be burned, together with the weeds around the margins of the fields. There were also many cornstalks scattered around the farm and these had to be collected and burned. The entire job was a small one in comparison with

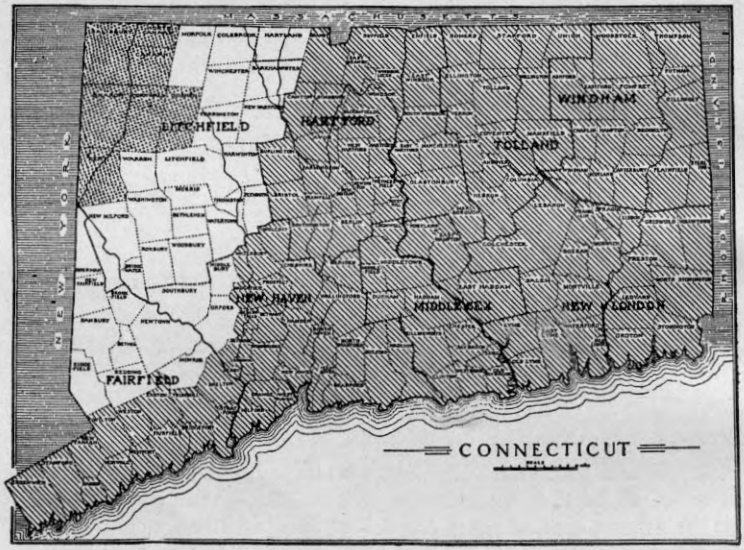

FIGURE 46. Map of Connecticut showing areas quarantined on account of the European corn borer. Portion at right shaded with diagonal lines, two-generation corn borer. Upper left corner stipple shading, one-generation corn borer.

clean-up operations of former years and was completed in three days by eight men, April 8 to 10. The stalks and stubble were burned with oil, and altogether 1,400 gallons of furnace oil were used in burning over these fields of about seven acres.

Enforcement of the Compulsory Clean-Up Law and Regulations

The General Assembly of 1929, as an aid in the control of the European corn borer, enacted a law making it compulsory for growers to dispose of all cornstalks or other infested material before April 10 of each year. This law is now Section 2125 of the General Statutes, and is as follows:

SEC. 2125. **European corn borer.** 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 section 2124, 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 corn stalks, shall, not later than April tenth of the year following that of their growth, completely dispose of such corn stalks 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. Any person who shall violate any provision of this section or any order, rule or regulation issued by authority of any such provision shall be fined not more than one hundred dollars.

This law is similar to the laws of Massachusetts and Rhode Island, and provides that the Director of this Station shall issue orders for the destruction or proper disposal of all cornstalks, tall stubble and the larger weeds, in towns that are under quarantine on account of the European corn borer. Consequently, on February 16, the following clean-up order was issued:

Pursuant to the provisions of Section 2125, General Statutes of Connecticut, revision of 1930, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, do hereby issue orders, rules and regulations as follows: That in the area quarantined on account of the European corn borer, all cornstalks shall be disposed of on or before April 20, by feeding to live stock, burning or plowing under cleanly, and that all of the larger weeds in and around the corn fields be likewise destroyed.

Effective February 16, 1931.

WILLIAM L. SLATE,
Director.

The matter was given considerable publicity so that most of the people to whom it might apply, knew of its existance. To make sure that the growers complied therewith, 16 farm inspectors were sent into the field on April 20 for nearly a month, seeking plant material that harbors the European corn borer, and if this were found, to confer with the grower and issue orders for its immediate destruction or other proper method of disposal. In issuing these orders the farm inspectors employed blanks prepared in this office, and arranged in the form of a return postal card. Both cards were filled out by the inspector. These indicated the procedure to be followed by the grower, who signed one card that was returned to the office by the inspector. The other card was left with the grower to be signed and sent to the office as soon as the clean-up was completed. This card form was used in 1930, but the cards were not numbered. In some cases the two portions of the card

bore different signatures, and the return portion was mailed from another town, or postoffice, so that it was very difficult to check them. In 1931, the cards were numbered serially and the same number stamped on each section of the double card to facilitate identification.

These inspectors visited 137 towns and issued 1,562 notice cards. Some of the return reports were not received at the proper time, and letters were sent to the growers who had failed to respond. Some 28 of these letters were returned undelivered, due perhaps to our inability to decipher the names, many of which were foreign. Altogether 1,377 of the 1,562 cards or 88.8 per cent were returned, stating that the instructions had been carried out. In many cases, failure to dispose of material susceptible of infestation, before the date set in the clean-up order, was due to the land being too wet to plow or work upon, broken down farm machinery, or sickness. As a rule the growers were willing to cooperate, when it had been brought to their attention that they were harboring a menace to the entire community. In the future it will probably be necessary to send inspectors into the field later in the season to make sure that the clean-up has been completed in cases where a report has not been received. Most of the trouble occurred over rented land. A man would hire a farm or piece of land for a season, then plant, cultivate and harvest a crop of corn. He would perhaps move away and leave the stalks and stubble in the fields. As he had no further interest in the land, and perhaps could not be reached, he could not be compelled to clean it up. In such cases the owner of the land must be held responsible for cleaning up the corn debris and other material. If the owner is unwilling to carry this responsibility, in the future he should have a written contract or agreement with the tenant making the latter responsible for the cost of such clean-up.

Quarantine

On account of the increased spread of the European corn borer in 1930, when 63 additional towns were found infested with the two-generation borer and five with the single-generation borer, changes in the quarantine lines became necessary. A public hearing was held at the Station November 25, 1930, then Federal quarantine action was awaited before revising the State quarantine. The following order was issued effective on and after February 1:

QUARANTINE ORDER NO. 28
CONCERNING THE EUROPEAN CORN BORER

The fact has been determined that the European corn borer has been found to occur in Connecticut outside of the areas restricted by Quarantine Order No. 24, effective January 15, 1930, and it is necessary to extend the quaran-

tine restrictions and regulations in conformity with Federal Quarantine No. 43, revised and effective January 23, 1931.

Pursuant to the provisions of Section 2124, General Statutes, a public hearing was held in New Haven on November 25, 1930. The order herein given extends the quarantine restrictions and regulations to additional towns in Tolland, Hartford, New Haven and Fairfield Counties on account of the two-generation European corn borer, and to additional towns in Litchfield County on account of the one-generation European corn borer.

Now, therefore, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, under authority conferred by Section 2124, General Statutes, do hereby proclaim the following towns to be under quarantine:

Two-Generation Regulated Area

All towns in Tolland, Windham, New London and Middlesex Counties; all towns except Hartland in Hartford County; the towns of Ansonia, Beacon Falls, Bethany, Branford, Cheshire, Derby, East Haven, Guilford, Hamden, Madison, Meriden, Milford, Naugatuck, New Haven, North Branford, North Haven, Orange, Prospect, Seymour, Wallingford, Waterbury, West Haven, Wolcott and Woodbridge in New Haven County; the towns of Bridgeport, Darien, Easton, Fairfield, Greenwich, New Canaan, Norwalk, Shelton, Stamford, Stratford, Trumbull, Weston, Westport, and Wilton in Fairfield County.

One-Generation Regulated Area

The towns of Canaan, Cornwall, Goshen, Kent, North Canaan, Salisbury and Sharon in Litchfield County.

Hereafter, under the authority of said Section 2124, General Statutes, restricted articles and materials from the restricted areas shall be moved or allowed to be moved to other points within the State only in conformance with the conditions prescribed in the Rules and Regulations appended hereto and made a part of this Quarantine Order.

This Quarantine Order and appended regulations supersede all former orders and regulations concerning the European corn borer, and shall become effective on and after February 1, 1931.

WILLIAM L. SLATE,
Director.

Approved:
WILBUR L. CROSS,
Governor.

The areas affected by this quarantine order, as revised, are shown on the map in Figure 46.

Scouting

Federal scouts were sent into the towns outside of quarantine and discovered infestations throughout the area scattered in such a manner as to warrant extending the two-generation quarantine over the entire state. Consequently scouting was discontinued before all towns in the area had been examined. As soon as the borer was definitely reported from the Federal laboratory, where it was sent for identification, the scouts left that town and went into the next.

Road Patrols

Federal road patrols were operated for a short time along the western border of the two-generation quarantined area (see Plate 6 *a*). When it was found that infestations already existed beyond, the patrols were discontinued, except across Fairfield County, where the quarantine areas for the Japanese beetle and the European corn borer coincided. These patrols were continued until September 5.

Survey of Degree of Infestation

In September, trained men were sent throughout New London and Windham Counties, and into six towns in Middlesex County and two towns in New Haven County to estimate the percentage of infestation in cornstalks. Considerable injury occurred in New London County in 1931, and several complaints of damage were received, in spite of the enforced clean-up. The infestation is of longer standing in New London County than in any other portion of the state. In this county, 113 acres examined averaged more than 80 borers to 100 plants, or 15,646 borers to the acre. The heaviest infestation was found in New London where there were 523 borers to 100 plants, or 101,738 borers to the acre. Certain sweet corn patches in the backyard gardens of Groton and New London averaged as high as 776 borers to 100 plants, or more than 150,000 borers to the acre. The infestations were much lighter in Middlesex, New Haven, and Windham Counties.

THE JAPANESE BEETLE IN CONNECTICUT IN 1931

W. E. Britton and J. P. Johnson

This paper records the progress of the operations for the control of the Japanese beetle, in immediate charge of Mr. Johnson, that are carried on in cooperation with the United States Plant Quarantine and Control Administration.

The Shelton office was discontinued July 1, and Mr. Johnson has since had office facilities at the Federal headquarters, 22 Elizabeth Street, South Norwalk.

Scouting for Beetles

The training of the scouting force commenced July 6, when 17 men assembled at Bridgeport. Fifteen other men gathered at Hartford the next day, July 7. The men were first given an illustrated lecture on the Japanese beetle, then instructed about making out field reports and the procedure to be followed when

scouting in the field. The men were then schooled in the field and shown how to find the beetles. This training period covered a week before the men were assigned to permanent crews of four each, the foremen of which were mostly men who had gained experience in preceding summers. The foremen visited South Norwalk July 10 and 11, when they were assigned motor cars and their field program of work for the season. Thus each division of the force was trained in that portion of the state where the men were expected to work, and they could see beetles in both Bridgeport and Hartford.

The scouting work in Hartford and Tolland Counties was supervised from the Hartford office and all other portions of the state were under the supervision of the South Norwalk office. Altogether, there were nine scouting crews, six of which were assigned to scouting around nurseries and greenhouses. The other three were engaged in a determination of the spread and increased intensity of the Japanese beetle population in the lightly infested areas. Two crews were assigned to Hartford and Tolland Counties.

A scouting itinerary for the summer had been prepared for each of the six nursery and greenhouse crews, in which the daily work was mapped out for each crew. These itineraries included all of the classified concerns, towns and cities, and were so arranged that the crews would scout classified establishments at different hours of the day on their alternate visits. The distance scouted around such establishments was not less than 500 feet nor more than 1000 feet. Where the entire area around a large nursery could not be covered in one day, it was so divided by the supervisor that separate portions would be scouted thoroughly on alternate visits.

The nursery and greenhouse scouting crews were so placed that each had its headquarters as near as possible to the center of the area of its operations. Consequently crews were stationed in Middletown, New Haven, Shelton, South Norwalk and Waterbury. The other crews, scouting to determine the spread of the beetle, were able to move about freely and they covered a large part of the state inspecting the smaller classified establishments in the towns where they were at work. The nursery and greenhouse scouts in scouting around some of the larger establishments, covered a major portion of certain towns or villages, and it required only a short time to complete the scouting in these places.

Beetles were found in 11 of the cities and towns scouted, and scouting was carried on around 162 classified nursery and greenhouse establishments in 1931.

The following cities and towns were scouted:

Bethel	Central Village	Cromwell
Bridgeport	Cheshire	Danbury
Canaan	Clinton	Danielson
Centerbrook	Colchester	Deep River

Durham	Mystic	Salisbury
East Hampton	Naugatuck	Saybrook
Essex	Newtown	Sharon
Falls Village	Niantic	Southington
Guilford	Norfolk	Stamford
Hartford	Norwich	Stonington
Jewett City	New Canaan	Terryville
Lakeville	New Milford	Thomaston
Litchfield	Plainfield	Torrington
Lyme	Plantsville	Wallingford
Madison	Pomfret	Waterbury
Meriden	Portland	Wauregan
Middletown	Putnam	Westbrook
Moosup	Ridgefield	Willimantic
		Winsted

New Infestations Discovered

Four towns were found infested with the Japanese beetle for the first time. These towns and the number of beetles found in each were as follows: Norwich, 1; Old Saybrook, 1; Ridgefield, 771; Torrington, 1. The beetles were sufficiently numerous on one place in Ridgefield to injure such plants as heliotrope, roses, and grape vines. The owners employed a commercial firm to spray all trees, shrubs, vines and herbaceous plants with coated lead arsenate.

Beetles Collected Around Old Infestations

Traps were placed in Enfield, Groton, Hartford, Meriden, New London and Willimantic. Some beetles were collected outside of the traps. The total number of beetles found in the old infestations was as follows:

Danbury	67	Meriden	32
Enfield	1	New London	385
Groton	4	Willimantic	15
Hartford	3,295	Total	3,799

The total number of beetles found outside of the generally infested area of 1930 was 4,574.

Quarantine Enforcement

The only change in the quarantined area since our report of last year is that Branford was put into the generally infested area in the revision of Federal Quarantine No. 48, effective November 30, 1930, and State Quarantine Order No. 27, effective February 1, 1931. The generally and lightly infested areas are shown on the map in Figure 47. The Quarantine Order is as follows:

QUARANTINE ORDER NO. 27

The fact has been determined that the Japanese beetle, *Popillia japonica* Newman, has been found to occur in Connecticut outside of the areas restricted by Quarantine Order No. 20, effective April 1, 1929, and it is necessary to extend the quarantine restrictions and regulations in conformity with Federal Quarantine No. 48, revised and effective November 10, 1930.

Pursuant to the provisions of Section 2124, General Statutes, a public hearing was held in New Haven on November 25, 1930. The order herein given extends the quarantine restrictions and regulations over the entire State; that portion in Fairfield and New Haven Counties restricted by

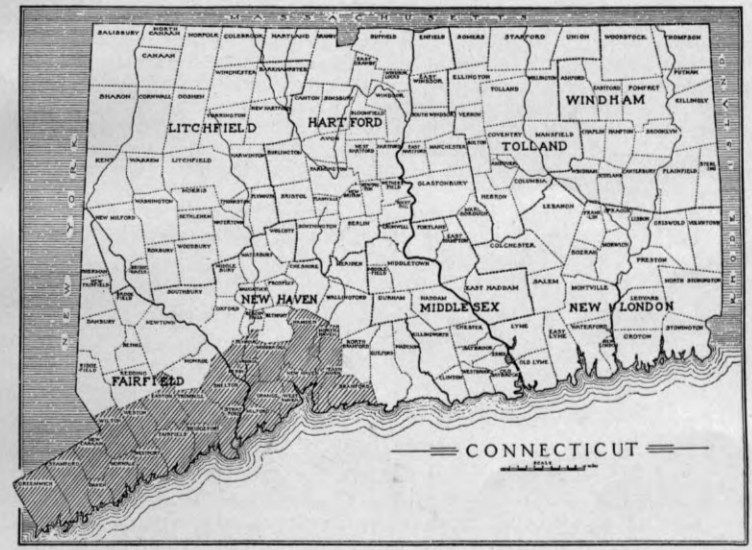

FIGURE 47. Map of Connecticut showing generally and lightly infested areas under quarantine on account of Japanese beetle. Shaded portion indicates generally infested area; unshaded portion, or remainder of the state is the lightly infested area.

Quarantine Order No. 20, with Branford added, will constitute the generally infested area; the remainder of the State will constitute the lightly infested area.

Now, therefore, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, under authority conferred by Section 2124, General Statutes, do hereby proclaim the following towns to be under quarantine and to be known as the generally infested area:

Bridgeport, Darien, Easton, Fairfield, Greenwich, New Canaan, Norwalk, Shelton, Stamford, Stratford, Trumbull, Weston, Westport and Wilton in Fairfield County; Ansonia, Branford, Derby, East Haven, Hamden, Milford, New Haven, North Haven, Orange, Seymour, West Haven and Woodbridge in New Haven County.

Also that the following towns be under quarantine and to be known as the lightly infested area:

All towns in Hartford, Litchfield, Middlesex, New London, Tolland and

Windham Counties; Beacon Falls, Bethany, Cheshire, Guilford, Madison, Meriden, Middlebury, Naugatuck, North Branford, Oxford, Prospect, Southbury, Wallingford, Waterbury and Wolcott in New Haven County; Bethel, Brookfield, Danbury, Monroe, New Fairfield, Newtown, Redding, Ridgefield and Sherman in Fairfield County.

Hereafter, under the authority of said Section 2124, General Statutes, (1) farm, garden, and orchard products of all kinds; (2) grain and forage crops of all kinds; (3) nursery, ornamental, and greenhouse stock, and other plants; and (4) sand, soil, earth, peat, compost, and manure shall not be shipped, offered for shipment to a common carrier, received for transportation or transported by a common carrier, or carried, transported, moved, or allowed to be moved from any of said towns or parts of towns into or through any other towns or parts of towns in manner or method or under conditions other than those prescribed in the rules and regulations hereinafter made and amendments thereto: *Provided,* That the restrictions of this quarantine and of the rules and regulations supplemental thereto may be limited to the areas in the towns or parts of towns now, or which may hereafter be, designated by the Director of the Connecticut Agricultural Experiment Station as regulated areas when, in the judgment of the Director of the Connecticut Agricultural Experiment Station, the enforcement of the aforesaid rules and regulations as to such regulated areas shall be adequate to prevent the spread of the Japanese beetle.

This Quarantine Order and appended regulations supersede all former orders and regulations concerning the Japanese beetle, and shall become effective on and after February 1, 1931.

WILLIAM L. SLATE,
Director.

Approved:
WILBUR L. CROSS,
Governor.

The regulations mentioned in the last paragraph of Quarantine Order No. 27, are identical with those of Federal Quarantine No. 48, except for such incidental changes as were necessary to make them applicable as state regulations. Quarantine Order No. 27 with appended regulations was published as Circular 74. The regulations are not reproduced in this report.

Inspection and Certification of Farm Products

During the summer of 1931, the inspection and certification of farm products consisted in the inspection of the entire farms where the crops were grown, and the inspection on platforms of the products in the city markets.

Inspection platforms centrally located, were erected in New Haven at 21 Lafayette Street and in Bridgeport at the foot of Water Street. Inspection stations were arranged in South Norwalk at 64-66 Water Street, and in Stamford at 222 Canal Street. The New Haven market is the largest in the state and supplies farm produce to nearly all sections of Connecticut. Men were on duty at this platform practically 24 hours each day, with most of the inspections and the main market business occurring during the

night. No beetles were found in any of these market inspections. The following table is a summary of the market inspection and certification of farm products:

CLASSIFICATION OF FARM PRODUCTS, MARKET INSPECTION

Number of packages certified

Articles	Bridgeport	New Haven	South Norwalk platform	South Norwalk office	Stamford	Total
Corn	22	4,113	0	0	0	4,135
Beans	2,500	17,867	1,468	24	0	21,859
Peas	1,659	5,590	1,374	0	0	8,623
Lettuce	3,204	20,440	2,192	44	0	25,890
Vegetables with top	27,169	23,028	3,423	13	0	53,633
Miscellaneous vegetables	17,199	125,313	11,555	409	0	154,476
Miscellaneous fruit	35,513	137,151	19,224	585	0	192,473
Bunches bananas	5,550	17,524	2,325	593	209	26,201
Boxes, cut flowers	79	252	19	647	9	1,006
	92,895	351,278	41,580	2,315	218	488,296

CERTIFICATION OF SAND, SOIL, EARTH, PEAT, COMPOST AND MANURE

Materials	In cars	In trucks	Total certificates
Sand	586	705	1,291
Manure	2	17	19
Total	588	722	1,310

Certificates based upon field inspections were issued to classified establishments and to individuals permitting the movement of farm produce, cut flowers, hay and straw, and nursery and floral stock. Altogether, 58,185 such certificates were issued, as is shown in the following table:

CERTIFICATES ISSUED ON PLANT MATERIALS

Farm products	Cut flowers	Hay and straw	Nursery and floral stock	Total number certificates
10,601	792	9	46,773	58,185

These certificates covered 4,806,036 plants. In addition 9,175 shipments were certified for classified establishments, but the kind and number of plants were not recorded.

Road Patrol Inspection

In 1931, 75 roads were posted with quarantine signs. Sixty-six of these led out of the generally infested area, and nine out of the lightly infested area. Altogether, 63 Federal inspectors were employed in patrolling the highways at the boundaries of the

quarantined areas. Some of the road patrol stations were continued throughout the danger season for transporting beetles, and others were kept in operation for brief periods. For the most part, those between the Naugatuck River and the New York line were for both the Japanese beetle and the European corn borer and were continued into September. (See Plate 6 *a*). All roads leading out of the generally infested area in New Haven County were covered by a floating road patrol. On all of these highways, 9,931 vehicles carrying quarantined articles were intercepted, and nearly half of them (4,394) found to be carrying such materials without certificates.

Soil Treatment

In the Report for 1930, page 553, is an account of the application of one-third of the necessary dosage of lead arsenate to kill Japanese beetle grubs in certain lawn areas in Hartford, New London and Willimantic. The remaining two-thirds was given approximately to these same areas in 1931. The materials applied in 1930 were in dry form—lead arsenate, one part; tankage, two parts; sand, four parts—distributed over the lawn in a fertilizer drill, and washed in with water from a hose. In 1931, the lead arsenate was all applied in liquid mixture—one pound in one gallon of water, and 500 gallons applied to an acre of lawn. With the applications of 1930, the approximate total of poison applied to these areas was 750 pounds per acre.

The material was applied by automobile truck power sprayers with 600-gallon tanks. Before applying the poison, preliminary trials with water gave the men an idea of the time necessary to apply a given quantity of material to a measured area of lawn. Experienced nozzlemen became quite expert in covering the area rapidly, but thoroughly. As soon as the poison had been distributed and before it had time to dry, it was washed from the grass blades and into the soil by applications of clear water from another sprayer held in readiness for the purpose. Two large areas were treated in Hartford as follows: (1) State Armory grounds; State Library grounds, westerly to Oak Street; State Capitol grounds; Bushnell Park as bounded by the Capitol grounds, Park River, Asylum and Trinity Streets, also a portion easterly of Trinity Street as far as the lake between Elm and Jewell Streets. (2) Asylum Street, those properties on the south side between Sumner and Huntington Streets; north of Asylum Street to Collins Street, between Sigourney and Broad Streets; the east half of the block bounded by Huntington, Collins, Ashley and Garden Streets; and properties on the east side of Garden Street from Ashley to Broad Streets. The Hartford City Park Department coöperated by defraying the cost of the materials used in

treating Bushnell Park. The materials were applied between May 12 and May 21, and a small corner completed after more poison was received, June 23 and 24. Altogether, 51.75 acres of lawn in Hartford were treated, using 22,250 pounds, or more than 11 tons of lead arsenate.

In Willimantic, the section bounded by Valley, Church, Summit, Hewitt and Prospect Streets, was given a treatment of lead arsenate, May 22 to 25. This area included 12.36 acres, and 6,050 pounds, or more than three tons, of lead arsenate were used.

In New London similar treatment of the lawn areas was given May 26 to 29. The section treated was bounded by Brainard, Granite, Richards, Huntington, Federal, Church, Manwaring, Williams and Mercer Streets; also about one-third of a block bounded by Cottage, Broad, Huntington, Jay and Franklin Streets; and about two-thirds of a block bounded by Cottage, Broad, Hemstead and Franklin Streets. Altogether, in New London about 17.51 acres were treated and 7,500 pounds, or 3.75 tons, of lead arsenate were used.

The total area treated in the three cities is equivalent to 81.62 acres, and 33,800 pounds, or 16.9 tons, of lead arsenate were used.

This treatment was under the personal supervision of Mr. Johnson; most of the materials were furnished by the State, and the lead arsenate and water were applied with labor and power outfits supplied by the Federal authorities. This method of application seemed to us to be an advantage over the dry method used last year and also less expensive. Illustrations of this method of application are shown on Plates 6, 7, and 8.

SPREAD OF THE SATIN MOTH AND CHANGE IN THE QUARANTINE

W. E. Britton

Mention of the spread of the satin moth, *Stilpnotia salicis* Linn., may be found in the Report of this Station for 1930, with the statement that the insect had been discovered in 32 additional towns. Federal Quarantine No. 53 was revised to include these towns, effective February 1, 1931. After due notice, a public hearing was held at the Station, February 11, and State Quarantine Order No. 29 was issued, becoming effective March 20, 1931. This quarantine amounts to an absolute embargo, as the movement of poplar and willow trees, or any parts thereof capable of propagation, is not allowed. The accompanying map shown in Figure 48, indicates the regulated and free areas of the state.

The changes in the satin moth quarantine, together with a brief illustrated account of the satin moth, were published as Circular 78, April 15, 1931. The quarantine order is as follows:

QUARANTINE ORDER NO. 29

CONCERNING THE SATIN MOTH

The fact has been determined that the satin moth, *Stilpnotia salicis* Linn., a pest of poplar and willow, has been found to occur in Connecticut outside of the areas restricted by Quarantine Order No. 19, effective March 15, 1929, and it is necessary to extend the quarantine restrictions and regulations to include all territory now known to be infested, in conformity with Federal Quarantine No. 53, as revised and effective February 1, 1931.

Pursuant to the provisions of Section 2124, General Statutes, a public hearing was held in New Haven on February 11, 1931. The present order

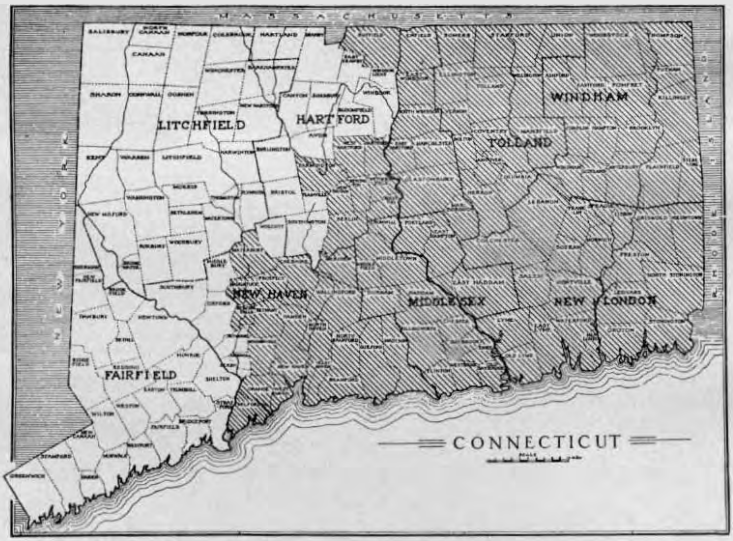

FIGURE 48. Map of Connecticut. Shaded portion is now under quarantine on account of the satin moth.

extends the quarantine restrictions and regulations over portions of Hartford and New Haven Counties.

Now, therefore, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, under authority conferred by Section 2124, General Statutes, do hereby proclaim the following area to be under quarantine.

All towns in Middlesex, New London, Tolland and Windham Counties; the towns of Berlin, East Hartford, East Windsor, Enfield, Farmington, Glastonbury, Hartford, Manchester, Marlborough, New Britain, Newington, Rocky Hill, South Windsor, Suffield, West Hartford and Wethersfield in Hartford County; and the towns of Beacon Falls, Bethany, Branford, Cheshire, East Haven, Guilford, Hamden, Madison, Meriden, Milford, Naugatuck, New Haven, North Branford, North Haven, Orange, Prospect, Wallingford, Waterbury, West Haven and Woodbridge in New Haven

County. It shall be unlawful to move any poplar or willow trees or parts thereof capable of propagation from the restricted area designated above to any other portion of the State.

This order shall take effect March 20, 1931.

WILLIAM L. SLATE,
Director.

Approved:
WILBUR L. CROSS,
Governor.

WORK WITH ORIENTAL FRUIT MOTH CONTROL IN 1931

PHILIP GARMAN

The Oriental peach moth is now called the Oriental fruit moth by vote of the American Association of Economic Entomologists. In general, depredations of this pest were greater than in 1930, but not so great as in 1929. Parasitism was low in many orchards early in the season, but increased in some during July and was apparently of considerable benefit.

We secured through the coöperation of Dr. H. W. Allen, of the Federal Bureau of Entomology at Moorestown, N. J., a supply of fruit moth and strawberry leaf roller larvae from which more than 10,000 *Macrocentrus ancylivora* adults were obtained. More than 11 million *Trichogramma minutum* parasites were produced and supplied to growers. In addition, several field experiments with Trichogramma were conducted and systematic collection of parasitized larvae and eggs were made in several orchards.

Table 5 gives results dealing with the number and condition of parasite shipments on arrival at their destination. It will be seen that 90 per cent or more were reported to have been received in good condition, and that 86 per cent arrived the day following shipment. Figure 49 shows the number of orchards in each township receiving parasites in 1931. An average of about 70 Trichogramma per tree was distributed and about one Macrocentrus to every 14 trees.

Table 7 gives the count of eggs parasitized by Trichogramma in six different orchards, and Table 6 the results of collections to determine Macrocentrus parasitism.

To learn what effect parasitism had on the actual fruit infestation, an inspection of peaches was made in four different orchards. These results, shown in Table 8, indicate that in orchards where parasites were abundant, infestation by the fruit moth was low, and *vice versa*. However, in other orchards, where both parasite species were known to be present, but in which no counts or percentage estimates were made, there were cases of severe infestation.

It was noted during the season that orchards presenting rank twig growth were most severely infested. Growers have consequently been advised to use judgment in the application of fertilizers and in cultivation and pruning so as to avoid, if possible, conditions favoring severe twig infestations. It may be mentioned also that brown rot is likely to appear in orchards growing under such conditions. It did in 1931.

Field experiments with Trichogramma indicate that the egg parasitism may be greatly increased by field liberations, but it has not been possible so far to increase it in Connecticut much above

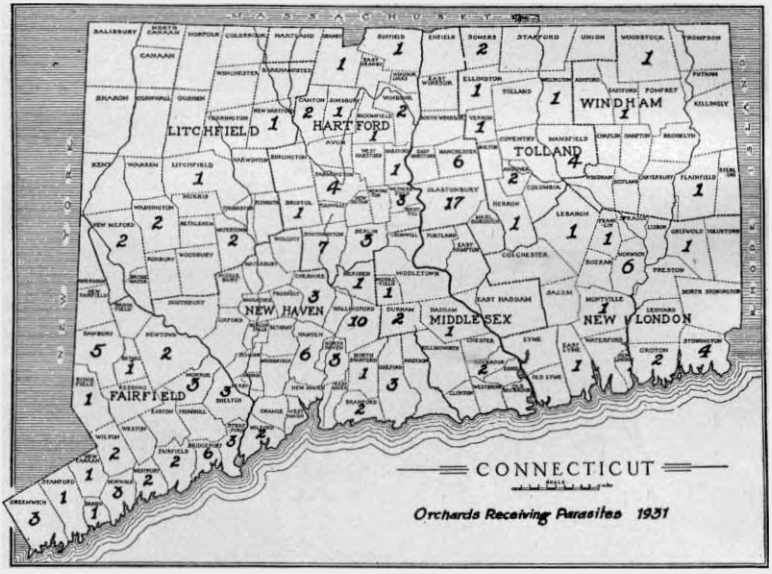

FIGURE 49. Map of Connecticut showing location of orchards in which Oriental fruit moth parasites were liberated in 1931.

50 per cent by this procedure. Field experiments with the flight of Trichogramma, however, indicate dispersal far beyond the tree in which the liberation was made. In addition, it has become apparent from laboratory experiments that sulfur dust has some effect on egg parasitism, especially at high temperatures. (Table 3.)

Other laboratory experiments consisted of Macrocentrus breeding, and refrigeration experiments with Trichogramma. Some of the refrigeration work is reported by Mr. Schread in another article. It was found that Macrocentrus can be bred in considerable numbers during the fall months and in limited quantities during the spring season. Attempts to hibernate the reared material were

not entirely successful, for considerable loss occurred in 1931. Macrocentrus breeding was carried on successfully during September, October, November and December, and considerable stocks of parasitized fruit moth larvae acquired. Some of these data are shown in Tables 1 and 2. In order to provide host material for Macrocentrus, fruit moth larvae have been reared in large numbers for which we have made use of various cages and incubators built during the last two years. In the breeding work so far, it has required more than 10 to 15 fruit moth eggs for every adult Macrocentrus reared. During 1930 to 1931, (November to November) more than 500,000 fruit moth eggs were obtained and during the fall of 1931, September to December inclusive, we secured a total of 195,800 eggs, or an ample number to supply food for 13,000 to 19,000 Macrocentrus.

Field experiments with control by insecticides were carried on in an orchard near the Experiment Station Farm at Mount Carmel. Several dusts, including a 90-10 lime-lead arsenate dust were applied. Some of the dust applications were followed by oil sprays. Fibrous talc was also used. The figures show a very low infestation of fruit moth in both check and treated plots, due in part to a very heavy crop and slow growth of the trees. Very little twig infestation was seen in this orchard during July. The best control was obtained by the application of four oiled dusts followed by one 2 per cent oil emulsion spray. On account of the low infestation, however, these experiments will need to be repeated. Quinces were also sprayed for control of the fruit moth. Only one material was used and this consisted of a 2 per cent pyrethrum impregnated white oil emulsion. Three applications were made in August and September. The number of uninfested fruit at harvest was about half that of unsprayed trees. Table 9. This corresponds in general with our 1930 results when considerable reduction in infested fruit was obtained with similar materials. The quince curculio was not controlled by the treatment, however, and measures of commercial value should also aim to control this troublesome enemy of the quince.

TABLE 1. FRUIT MOTH EGG PRODUCTION DURING THE FALL OF 1931

Month	Number of moths used	Number of eggs obtained
September	....	74,800
October	4,969	29,600
November	3,583	52,300
December	1,371	39,100
Totals	9,923	195,800

TABLE 2. RECORD OF MACROCENTRUS PRODUCTION, 1930-1931

Month	1930	1931
August	2,051	2,398
September	1,948	841
October	1,599	1,547
November	300	859
December	237	744
	6,135	6,385
Estimated in storage at end of December	3,700[1]	12,000

TABLE 3. PRELIMINARY RESULTS OF EXPERIMENTS WITH THE EFFECT OF SULFUR ON TRICHOGRAMMA PARASITISM, GREENHOUSE AND LABORATORY EXPERIMENT

Sulfured eggs Per cent parasitized	Check Per cent parasitized	Average temperature
20	100	82
42	100	82
52	100	72
63	100	72
100	100	67
100	100	67

Notes: Potted peach seedlings with fruit moth eggs on the leav were dusted with fine sulfur dust, and a fairly large number of Tric ogramma released under cloth-covered jars containing the seedlin Yellow species used and approximately the same number of parasit and eggs in each test.

TABLE 4. DETAILS OF PARASITE DISTRIBUTION, 1931

County	Tricho-gramma	Macro-centrus	Number trees	Ratio per tree Tricho.	Ratio per tree Macro.	Number growers
Fairfield	1,892,600	2,750	32,426	57 per tree	1 to 11 trees	41
Hartford	4,352,000	3,426	62,425	70 " "	1 to 18 "	50
New Haven	2,808,300	2,370	31,523	89 " "	1 to 13 "	31
New London	737,500	870	11,675	63 " "	1 to 13 "	17
Total of 4 peach growing counties	9,790,400	9,416	138,049	70 " "	1 to 14.5 "	139
Others	1,547,000	1,320				28
Totals	11,337,400	10,736				167

[1]Actual emergence in spring was much below this figure, due to mortality during hibernation.

TABLE 5. DETAILS OF PARASITE DISTRIBUTION, 1931

County	Shipments per county	Number acknowledged	Percentage reaching destination			Number of dead Macros.	Macros. reaching destination alive %	Shipments arriving in good condition %
			1 day	2 days	3 days			
Fairfield	43	34	94	6	0	116	95	93
Hartford	103	56	80	20	0	36	99	96
Litchfield	9	7	43	28.5	28.5	7	94	85
Middlesex	6	5	100	0	0	9	98	80
New Haven	73	48	93	5	3	16	99	95
New London	25	23	95.5	4.5	0	5	99	95
Tolland	19	17	70	18	12	21	95	88
Windham	4	1	100	0	0	0	100	100
Totals	282	191	86	11	2	210	98	91.5

TABLE 6. RESULTS OF 1931 TWIG COLLECTIONS

Orchard	Total moths	Per cent parasitism by *Macrocentrus ancylivora*	Macrocentrus liberations
Avery, Yantic	29	0	1930
Homewood Farms, Greenwich	26	0	0
Kneuer, Guilford	48	0	1930
Platt, Milford	67	0	0
Pero, Manchester	32	23 (100% August)	1930
Root, Farmington	38	15 (85% August)	1929, 1930
Conn. Agr. Col., Storrs	74	0	0

TABLE 7. TRICHOGRAMMA EGG PARASITISM IN SIX ORCHARDS, 1931

Orchard	Average seasonal parasitism	Average parasitism July, August	Number collections
Avery, Yantic	23	47	4, June to Aug.
Kneuer, Guilford	15	30	4, June to Aug.
Platt, Milford	17	35	4, June to Aug.
Pero, Manchester	43	55	4, June to Aug.
Root, Farmington	48	68	6, June to Sept.
Conn. Agr. Col., Storrs	5	10	4, June to Aug.

TABLE 8. EFFECT OF FRUIT MOTH PARASITISM ON FRUIT INFESTATION, 1931

Orchard	Average Trich. parasitism for July and August	Macrocentrus present	Elberta fruit infestation
A	68	yes	18
B	55	yes (abundant)	8
C	17	no	50
D	15	no	80

TABLE 9. RESULTS OF SPRAYING QUINCES FOR CONTROL OF THE ORIENTAL FRUIT MOTH, 1931

Treatment	Tree Number	Total fruits	Number larvae obtained	Larvae per 100 fruits	Percentage infested by fruit moth
2% white oil emulsion: Oil containing pyrethrum extract of 1 lb. to each gallon of oil. Milk emulsifier. Applied Aug. 20, Sept. 2, Sept. 14.	2	370	96	26	27
	4	63	19	30	25
	6	182	49	27	19
	8	315	83	26	24
	10	339	82	24	24
Totals and averages		1,269	329	26	24.8
Check, no treatment	3	120	87	72	72
	5	31	16	51	48
	9	324	147	45	38
Totals and averages		475	250	52	46.8

NOTES ON THE CONTROL OF THE APPLE LEAFHOPPERS IN CONNECTICUT

PHILIP GARMAN

Appearance of leafhoppers in apple orchards early in the year prompted control experiments from which it was learned that the main species involved was the white apple leafhopper, *Typhlocyba pomaria*[1] McAtee. *Typhlocyba rosae*[1] Linn., small numbers of *Empoasca maligna* Walsh (*mali* LeB.), the potato leafhopper *Empoasca fabae* Harris, and *Erythroneura obliqua* Say, were present in late summer. The oblique banded leafhopper, *E. obliqua* Say, was found doing considerable damage in July in a commercial peach orchard. By far the most numerous and important species on apple was *Typhlocyba pomaria*. Structural details are shown in Figure 50.

Our first measures for control consisted of six tests of winter oils and tar distillate washes, all of which failed to control the insect in the egg stage. Results of these tests are found in Table 10.

Following the experiments with winter oils, the orchard was divided into three plots, one of which was sprayed with a commercial fungicide and lead arsenate at the calyx period, the second with lime-sulfur and lead arsenate at calyx and two-weeks periods, and

[1]McAtee recognized that two species were included under *Empoa rosae* (the rose leafhopper) in 1926, but it was not until recently that his work was generally accepted.

the third with lime-sulfur, lead arsenate, and nicotine sulfate at calyx, but without nicotine at the two-weeks period. The best control was secured with the combinations containing nicotine sulfate, though some was obtained with lime-sulfur plus lead arsenate. The results are given in Table 11.

A heavy infestation of apple leafhoppers having developed in the meantime at the orchard of S. R. MacDonald of Wallingford, some of our experiments were transferred there. S. Leonard Root of Farmington also coöperated and applied a number of different sprays. Three per cent nicotine dust was tested in the MacDonald orchard in an effort to control the mature hoppers, which were very abundant. As a result of three different applications, it was concluded that the material would give a fair kill under restricted

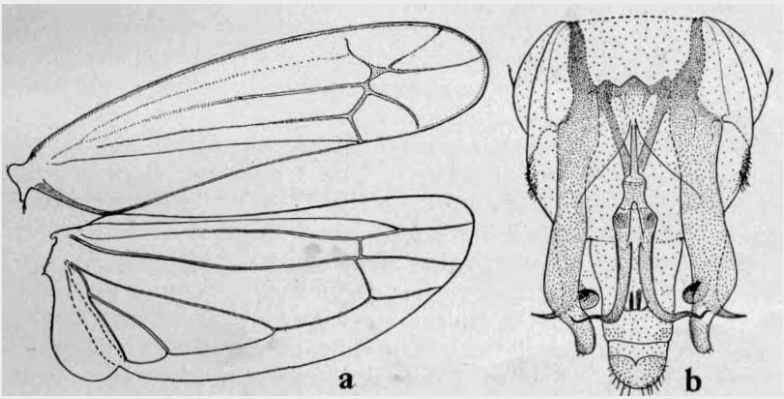

FIGURE 50. White apple leafhopper. A, wings; b, male genitalia, all greatly enlarged.

conditions, but was too uncertain to be depended upon. The best kill of mature hoppers was obtained in this orchard with sprays consisting of lime-sulfur, iron sulfate, and nicotine sulfate, which materially lessened the number of hoppers in several tests. In connection with the lime-sulfur-nicotine sulfate sprays, work was commenced with nicotine activators and pyrethrum sprays, the results being in favor of lime-sulfur-nicotine sulfate combinations. Table 12.

The abundant development of nymphs towards the latter part of August, however, seemed to preclude the use of lime-sulfur sprays in orchard practice at this time of year because of spray residues, and further experiments were conducted with soaps and nicotine sulfate; activators and nicotine sulfate; summer oils; and pyrethrum products. The best and most complete kills obtained were with sodium fish oil soap, Table 13, (3 pounds to 100 gallons) plus nicotine sulfate (1 pint to 100 gallons), although oil emulsions

plus nicotine sulfate gave satisfactory results. There is some indication that the amount of nicotine may be reduced, but not omitted, when summer oils are used. Tests at the Station Farm did not give favorable results in every case where soaps and reduced nicotine sulfate charges were employed. Table 14. However, Mr. Root secured commercial control of the nymphs with potash fish-oil-soap and nicotine sulfate combinations. Control at the MacDonald orchard with soap-nicotine-sulfate combinations was not so successful.

By a combination of nicotine sulfate it was found that good results could be obtained with bead soaps, which are much more convenient to use than bar or paste soaps. The more or less solid sodium fish oil soaps require so much time to dissolve that their use on a large scale is not practical with ordinary equipment.

Special life history studies of the leafhoppers were not conducted this year, but the insects were kept under observation continually during the summer.

Nymphs were present in trees at Mount Carmel on May 5 and the first adults appeared between June 1 and June 8, or shortly after the seven-day spray in our orchard. Adult leafhoppers continued to increase in orchards until about the first of July, when they began to decrease, and they were scarce during early August. Nymphs began to be numerous again the last week in August, and during the first week in September were very abundant. Adults were again abundant after the middle of September and were present until the first of November (collected November 4 to November 10 at Mount Carmel).

Parasitism by *Aphelopus* sp. (Plate 9) amounted to 4 per cent in Root's orchard, Farmington, and 16 per cent in the MacDonald orchard, Wallingford, in September. Lacewing flies, *Chrysopa* sp., were abundant in several orchards, but evidently none of the leafhopper enemies were numerous enough in 1931 to reduce the infestation noticeably.

Summary. Neither lubricating oils, nor tar distillate washes, nor combinations of both afforded control of leafhopper eggs. Lime-sulfur plus nicotine sulfate with iron sulfate added to prevent leaf burn, gave the best kill of mature hoppers in midsummer. If late summer treatments are needed, soap and nicotine sulfate will give good results, and if red mites are also present, summer oils may be combined with nicotine sulfate for control of both pests at the same time. Thorough applications to bearing and non-bearing trees are desirable since there is some danger of migration from tree to tree.

TABLE 10. LEAFHOPPER EXPERIMENTS, 1931: DELAYED DORMANT APPLICATIONS

Treatment	Leafhopper nymphs per 100 leaves
Tar distillate wash, 6⅓ gals Water, 100 gals.	13
Tar distillate wash, 10 gals. Water, 100 gals.	
Oil emulsion, 2.5 gals. Tar distillate wash, 2.5 gals. Water, 100 gals.	15
Miscible oil, 5 gals Cresol, 0.5 gals. Water, 100 gals.	10
Miscible oil, 5 gals. Water, 100 gals.	11
Oil emulsion, 5 gals. Water, 100 gals.	9
Check, no treatment	12.8

Notes: Application May 5, examination May 20.

TABLE 11. LEAFHOPPER EXPERIMENTS, 1931: CALYX APPLICATIONS

Experiment No. 1

Treatment	Leafhopper nymphs per 100 leaves
Sodium polysulfide, plus lead arsenate, plus casein lime	16
Lime-sulfur, 2 gals. Lead arsenate, 2 lbs Water, 100 gals.	8.5
Lime-sulfur, 2 gals. Lead arsenate, 2 lbs. Nicotine sulfate, 1 pint Water, 100 gals.	5[1] 0.4[1]
Check, no treatment	20

Experiment No. 2

Lime-sulfur, 2 gals. Lead arsenate, 2 lbs. Nicotine sulfate, 1⅓ pints Water, 100 gals.	1.3
Check, no treatment	22

Notes: Application May 25, examination May 28.
[1]Two experiments in different parts of the orchard.

TABLE 12. LEAFHOPPER EXPERIMENTS AT MACDONALD'S ORCHARD, WALLINGFORD, 1931

Treatment	Live nymphs per 100 spurs	Live hoppers per 100 spurs	Notes
Mineral oil activator, 1½ qts. Nicotine sulfate, ⅓ pint Water, 75 gals.	12	33	No kill of mature hoppers
Check, no treatment	20	38	.....
Mineral oil activator, 1½ qts. Water, 75 gals.	13	50	No kill of mature hoppers
Activator plus pyrethrum, 1 qt. Water, 100 gals.	0	28	Some dead hoppers under trees
Check, no treatment	17	51	.....
Lime-sulfur, 1¼ gals. Nicotine sulfate, 1 pint Iron sulfate, 1 lb. Water, 100 gals.	1.7	7	Many mature hoppers killed
Check, no treatment	21	70	
Average of all checks	19	53	

TABLE 13. LEAFHOPPER EXPERIMENT AT MACDONALD'S ORCHARD, WALLINGFORD[1]

Treatment	Number leaves examined	Number dead nymphs	Number live nymphs	Live nymphs per 100 leaves	Percentage killed
Sodium fish oil soap, 3 lbs. Nicotine sulfate, 1 pint Water, 100 gallons	391	469	28	7	94.3
Check, no treatment	113	0	205	181	0.0

[1]Notes: Sprayed Sept. 1, examined Sept. 2, 1931.

TABLE 14. LEAFHOPPER CONTROL EXPERIMENTS, MOUNT CARMEL FARM, 1931

Treatment	Nymphs per 100 leaves	Notes
Potassium oleate, 6 lbs. Water, 100 gals.	56	
Potassium oleate, 6 lbs. Nicotine sulfate, 6 oz. Water, 100 gals.	55	
White oil, 1 gal.[1] Water, 100 gals.	56	
Miscible oil, 1 gal. Sodium polysulfide, 1 gal. Water, 200 gals.	35	
Fish oil soap, 3 lbs. Water, 100 gals.	39	Sprayed September 4; examined September 5-7; power outfit used: Two large apple trees to each test.
Fish oil soap, 3 lbs. Nicotine sulfate, 6 oz. Water, 100 gals.	11	
Summer emulsion, 1 gal. Nicotine sulfate, 1 pint Water, 100 gals.	4	
Summer emulsion, 1 gal. Nicotine sulfate, ½ pint Water, 100 gals.	13	
Check, no treatment	44	
Summer emulsion, 1 gal. Water, 100 gals.	47	Sprayed September 14, examined September 15.
Check, no treatment	32	

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[1]Containing pyrethrum extract of 1 pound of flowers in each gallon of oil.

TESTS OF A MINERAL OIL ACTIVATOR FOR INCREASING THE KILL OF NICOTINE SULFATE

PHILIP GARMAN

Because of the general rise of interest in nicotine activators, tests were conducted with one of the best known to learn if variations in temperatures and humidity have any effect on toxicity. Experiments were begun in control of *Aphis rumicis* with variable dilutions of nicotine sulfate ranging from 1–1,000 to 1–4,000 by volume. The same treatments were then given the aphids, after which they were placed in incubators kept at given temperatures and humidities for 24 hours. See Tables 15 and 16. In addition, a series of experiments by Mr. Turner are included showing a comparison of nicotine sulfate with and without activator for control of *Macrosiphum solidaginis*.

The results, in general, show slight but not significant differences in toxicity at the different humidities and temperatures. There is little doubt that the activators increase the toxicity, although the increase at 1 to 2,000 for *M. solidaginis* did not equal the nicotine sulfate at 1 to 800 dilution. In several cases, the kill at 1 to 4,000 did not equal the kill of nicotine sulfate at 1 to 1,000. In view of these results, we believe dilutions greater than 1 to 2,000 with this activator cannot be recommended except in specific instances. Our results further indicate that the activator itself accounts for 19 to 25 per cent mortality of the aphids studied.

TABLE 15. TESTS WITH PENETROL AND NICOTINE SULFATE AGAINST *Aphis rumicis*

Treatment	Total aphids	Number dead	Per cent dead	Number tests
Greenhouse — variable temperature and humidity				
Check, no treatment	324	28	8	7
Penetrol, 1-200	359	91	25	5
Nicotine sulfate, 1-1000	785	557	71	9
Penetrol, 1-200 Nicotine sulfate, 1-2000	394	311	79	7
Penetrol, 1-200 Nicotine sulfate, 1-4000	497	281	56	8
Incubator — temperature 80° F., relative humidity, 70-75 per cent				
Check, no treatment	183	18	9	5
Nicotine sulfate, 1-1000	300	197	65	5
Nicotine sulfate, 1-2000 Penetrol, 1-200	344	279	81	5
Nicotine sulfate, 1-4000 Penetrol, 1-200	403	301	74	5

TABLE 15. TESTS WITH PENETROL AND NICOTINE SULFATE—*(Continued)*

Treatment	Total aphids	Number dead	Per cent dead	Number tests
Incubator — temperature 79-80° F., humidity 25-30 per cent				
Check, no treatment	97	2	2	4
Nicotine sulfate, 1-1000	117	87	74	
Nicotine sulfate, 1-2000 Penetrol, 1-200	142	121	85	4
Nicotine sulfate, 1-4000 Penetrol, 1-200	381	354	93	4
Incubator — temperature 69-70° F., humidity 70-75 per cent				
Check, no treatment	96	1	1	4
Nicotine sulfate, 1-1000	109	120	71	5
Nicotine sulfate, 1-2000 Penetrol, 1-200	167	157	94	5
Nicotine sulfate, 1-4000 Penetrol, 1-200	161	128	79	4
Incubator — temperature 80-81° F., humidity 85-90 per cent				
Check, no treatment	108	5	4	5
Nicotine sulfate, 1-1000	186	124	66	5
Nicotine sulfate, 1-2000 Penetrol, 1-200	185	162	87	5
Nicotine sulfate, 1-4000 Penetrol, 1-200	95	77	81	4

TABLE 16. GENERAL SUMMARY OF TESTS WITH PENETROL AND NICOTINE SULFATE AGAINST *Aphis rumicis*

Treatment	Per cent kill					Average of all percentages
	Greenhouse	80° 85-90% R. H.	80° 70-75% R. H.	80° 25-30% R. H.	70° 70-75% R. H.	
Nicotine sulfate, 1-1000	68	66	65	74	71	68%
Nicotine sulfate, 1-2000 Penetrol, 1-200	79	87	81	85	94	85%
Nicotine sulfate, 1-4000 Penetrol, 1-200	55	81	74	93	79	78%
Penetrol, 1-200	25	—	—	—	—	—
Check, no treatment	8	4	9	2	1	4.8%

TABLE 17. EXPERIMENTS WITH NICOTINE SULFATE AND PENETROL AGAINST *Macrosiphum solidaginis*, JULY AND AUGUST 1929[1]

Treatment and dilution	Total aphids	Number dead	Per cent dead	Number tests
Nicotine sulfate, 1-800	920	649	70.5	12
Nicotine sulfate, 1-2000 Penetrol, 1-200	936	574	61.3	12
Penetrol, 1-200 by weight	364	71	19.0	4

Penetrol and nicotine sulfate at 1-2000 are about equal in toxicity to nicotine sulfate alone at 1-800.

[1]Data by Neely Turner.

MOSQUITO CONTROL IN CONNECTICUT, 1931

R. C. Botsford

The actual work of overhauling the salt marsh system began on March 30. The total salt marsh area ditched and maintained by the State increased to more than 11,000 acres in 1931. When the work came to an end on November 1, the total area had been thoroughly patroled; ditches had been examined and cleaned, and graded or widened as necessary. In some areas where ditches were spaced too far apart and breeding occurred, a new ditch was dug midway between the old ditches. Thus, the ditch spacing was reduced by one-half, more rapid drainage promoted and the area permanently improved. Some of the most necessary repair work was done on tide gates, dikes, and outlet culverts.

The amount of work became possible through an increase of the mosquito elimination budget from $25,000 to $30,000 for the biennium, and also because of the increased efficiency of experienced crews.

On the average 12 men were employed on maintenance work this season. These were divided into three groups consisting of one working foreman and three workmen each, with auto transportation on a mileage basis for each group.

Nicholas Matiuck, overseer of the western or Fairfield-Stamford district, was suspended from duty on July 15, Lewis H. Bracken assigned as working foreman, and a new crew was organized. On July 22 a thorough inspection of the western district was started and a written report of the exact condition of the salt marshes and drainage systems submitted to the Director. This survey was made by T. H. Bracken, who had previous experience in Massachusetts, Connecticut, and New York. The inspection was completed on August 20. A similar inspection was made in the Hammonasset State Park in Madison where mosquitoes were troublesome during the latter part of July and periodically through August and early September. A few small mosquito-breeding places were found in the park area, but about one mile away in the town of Clinton is an unditched area of about 100 acres where mosquitoes develop in numbers sufficient to infest all the nearby communities.

A bad condition still exists in the rear of Grove Beach, Clinton, due to the lack of a proper outlet at Beach Park Road. This can be improved by the installation of a tight tide gate at that point.

At Middle Beach, Westbrook, the 18 inch corrugated iron outlet culvert installed in 1923 was replaced by 20 inch tile with the exception of the outer end where corrugated iron pipe was used. A new corrugated iron outlet culvert was installed at Stannard

Beach where the outlet of the salt marsh was closed by a sand bar and could not be kept open except by daily shoveling.

In West Haven at the outlet of Old Field Creek a permanent culvert with tide gate was installed. This unit consists of a concrete manhole five feet square containing a 30 inch Calco gate. From this manhole about 75 feet of 30 inch cast iron pipe set on piling extends outward underneath the beach. The total cost of installation was $1,800, one-half of which was paid by the town of West Haven and one-half by the Station. This unit promises to be a valuable addition to the storm water drainage system of the town, and will result in considerable saving in maintenance cost of the mosquito ditching system.

Conditions favored mosquito breeding on the salt marshes during the latter half of the summer, and in some communities mosquitoes were numerous. Breeding occurred in some spots that in previous years remained dry throughout the season, which made necessary the installation of extra spur ditches. In some towns where maintenance service had been improved from year to year, mosquitoes were scarce.

New ditching work was carried on in Stonington and Old Lyme under contract by John F. Ross. Mosquito elimination work in Old Lyme was initiated by Commodore N. M. Terry in September, 1926. Since that time, funds were appropriated yearly by vote of the town and the work progressed as the funds were raised. The work was completed June 30, 1931, at the cost of $12,717.06 and the ditches will be maintained as long as funds are provided.

In Stonington all the funds were raised by committees under the League of Women Voters with Mrs. Frank Dodge as Chairman. The ditches were completed this year at the cost of $7,514.35 and are now under state maintenance.

Funds sufficient to ditch salt marshes in the town of Groton were raised locally and the work will be started in 1932.

The largest unditched areas remaining in the state are in Stratford and Milford. As yet nothing has been done to organize an anti-mosquito campaign in either town.

The following tabulation shows the status of salt marsh areas:

STATUS OF CONNECTICUT SALT MARSH AREAS, 1931

Town	Salt marsh areas	Salt marsh ditched	Maintained by state	Total cost of ditching	Labor, cost maintenance, 1931	Labor, cost to complete ditching
Greenwich	200	200	none	$22,000.00	.....	.....
Stamford	300	300	300	3,245.80	$144.88	.....
Darien	300	300	none	3,800.00	.....	.....
Norwalk	600	600	600	7,500.00	520.08	.....
Westport	400	400	400	5,913.82	455.20	.....
Fairfield	1,200	1,200	1,200	8,400.00	632.12	.....

STATUS OF CONNECTICUT SALT MARSH AREAS, 1931—*(Continued)*

Town	Salt marsh areas	Salt marsh ditched	Maintained by state	Total cost of ditching	Labor, cost maintenance, 1931	Labor, cost to complete ditching
Bridgeport	173	....	....	.....	.....	$ 3,000.00
Stratford	1,315	....	....	.....	.....	20,000.00
Milford	630	....	....	.....	.....	9,500.00
West Haven	463	222	222	.....[1]	$1,044.44	3,500.00
New Haven	750	750	675	$12,000.00	580.80	750.00
Hamden	571	571	571	5,410.19	99.80	.....
North Haven	310	....	....	.....	.....	3,100.00
East Haven	545	300	300	3,747.52	78.88	1,300.00
Branford	895	895	895	.....	875.34	.....
Guilford	1,085	1,085	1,085	20,000.00	1,496.66	.....
Madison	1,315	1,315	1,315	.....	1,493.33[2]	.....
Clinton	785	677	500	10,000.00	206.60	2,000.00
Westbrook	500	500	500	7,428.14	1,254.80	.....
Old Saybrook	1,373	386	386	4,000.00	214.68	11,000.00
Lyme	493	....	....	.....	.....	7,500.00
Old Lyme	1,393	1,393	1,393	12,717.06	610.50	.....
East Lyme	424	130	130	1,480.60	46.00	4,000.00
Waterford	204	....	....	.....	.....	3,500.00
New London	34	....	....	.....	.....	500.00
Groton	304	50	50	1,000.00	0.00	4,000.00
Stonington	641	641	641	7,514.35	388.03	.....
Totals	17,203	11,915	11,163	$136,157.48	$10,150.14	$73,650.00

In New Canaan, Raymond F. Hart continued his observations and experiments on the control of fresh water mosquitoes.

Practically all yards within the area of a mile radius from the center of the town were inspected for breeding, and 98 such places were found. Besides these, there was a total of 93 field breeding places, 20 of which were newly discovered. Of these 93 breeding places, 50 contained Anopheles larvae.

Breeding places totaled as follows: Ponds and pools, 40; marshes and swamps, 31; streams and ditches, 18; miscellaneous, 4. The predominant mosquito was *Culex pipiens,* or rain barrel mosquito, with *Aëdes canadensis,* woodland pool mosquito, a close second. Many *Anopheles punctipennis* were found and also a few mosquitoes that breed only in the salt marshes.

A pyrethrum-kerosene larvacide was used and found satisfactory where oil was objectionable, but it probably will not displace oil as a general killing agent.

An artificial pond was stocked last summer with the common killifish, *Fundulus heteroclitus.*

Mosquito breeding in New Canaan or in any community can be controlled, but the effectiveness of the control depends largely upon the coöperation of the citizens.

[1]Ditched with New Haven.
[2]Includes $784.29 paid by State Park Commission.

OUTBREAK OF THE ELM LEAF BEETLE

W. E. Britton

More damage was caused by the elm leaf beetle, *Galerucella luteola* Mull., in Connecticut in 1931 than for at least 15 years. This insect has increased in numbers each year for the past four or five years, gradually building up to the point of ability to cause widespread destruction. Not only was this condition present in Connecticut, but severe injury was also reported from several of the northeastern states. In Connecticut most of the unsprayed trees in cities and villages of the Central Lowland area were brown in July, and later were nearly or quite defoliated. The beetle was destructive all along the coast and up the river valleys. There was less injury in the northern portion of the state, especially at the higher altitudes.

On July 16, Mr. Ashworth reported that the elm trees were brown in Durham, Middletown and Plainfield. Mr. Zappe reported that severe injury had occurred in the shore towns between the Connecticut River and the Rhode Island line, and in the villages east of the Connecticut River, especially in East Hartford and Glastonbury. Reports were received from various sources of severe injury in Litchfield, Newtown, North Stonington, Norwich, Ridgefield, Thomaston, Wallingford, and Westport. See Plate 15 *b*.

In 1931, the injury developed later in the season than usual. It was late when the eggs were deposited, late when they hatched, and the larval feeding, defoliation, and pupation were correspondingly late. Some of the defoliated trees put out a new crop of leaves. The abundance of moisture favored this additional growth. However, such defoliation weakens the trees, and two or three complete defoliations will seriously injure or kill them.

As a rule, if precipitation is frequent and abundant at the time of pupation, which usually occurs the latter half of July, many of the pupae are killed by a white mold or fungus, *Sporotrichum globuliferum* Speg. During the periods of pupation in the three preceding seasons of 1928, 1929 and 1930, there was an absence of rainfall. This fungus could not then become active in killing the pupae, and this may perhaps have been an important factor in building up the beetle population to such a point as to make possible the elm leaf beetle outbreak of 1931. However, there was an abundance of moisture in July and August, 1931, and the white fungus was observed in a few cases. If moist seasons prevail for a few years, we may expect the elm leaf beetle to subside.

In all probability there will be a sufficient crop of beetles to cause injury in 1932, and the trees should be sprayed thoroughly with lead arsenate in all localities where the elm trees were injured in 1931. It is dangerous to neglect this treatment. All choice elm trees should be sprayed each season.

THE PICKLE WORM IN CONNECTICUT

Diaphania nitidalis Stoll.

W. E. Britton

In 1931, for the first time in Connecticut, my attention was called to definite injury to cucumber and squash by the pickle worm. The first specimens were larvae boring in summer squash, collected in Hamden by Dr. Garman and Mr. Zappe, September 24. Green larvae tunneling in cucumbers were received October 1, from Cos Cob. An adult emerged October 24, and proved to be this species. Damage was also reported from Branford, Bridgeport, Southington, Southport, Trumbull, and Westport.

Life History and Habits

This insect hibernates in the cocoon in a curled leaf usually on the ground, and the moth emerges rather late in the season. The eggs are deposited singly or in clusters of from three to eight on the flowers, buds, or tender terminal leaves. They are loosely attached to the plant hairs and may be readily brushed off. The eggs hatch in three or four days and the young caterpillars burrow into the soft tissues of the bud or flower. Some of the caterpillars may complete their development wholly in the blossoms of squash, but others after the first or second molt tunnel in the fruits. On cucumber and melon the caterpillars, when about half-grown, enter the fruit; some feed in the rind and others burrow into the center. The excavated material, or sawdust, is thrown out around the entrance to the tunnel. The injury often causes the fruit to decay, especially in cantaloupes.

When fully grown the caterpillar is between one-half and three-fourths of an inch in length and in color is whitish, yellowish or greenish, with head and thoracic shield yellowish brown. A period varying between 12 and 16 days is required for larval development. The caterpillar then spins a loose silken cocoon in a curled leaf and the following day transforms to a pale green pupa less than three-fourths of an inch in length. In a brief time this pupa changes to a brownish color. In summer the duration of the pupal stage varies between a week and 10 days, and in North Carolina the complete life cycle varies between 23 and 31 days, and there are four annual generations. The number of generations in the northern states is not known, but is surely less than in North Carolina.

The moth has a wing spread of an inch and is generally yellowish brown with purple metallic reflections. A large irregular spot near the center of the front wing and the basal two-thirds of the rear wing is yellow and semi-transparent, as shown on Plate 14 *c*.

The apex of the abdomen in both sexes bears a brush of long scales, larger in the male. The moths do not fly during the day or first half of the night. They become active and deposit their eggs after midnight, and hide before dawn.

Control Measures

Sprays for the control of this insect have not proved successful. All trash, vines and refuse fruits should be gathered and burned as soon as the crop has been harvested. Fall plowing will bury many of the pupae and is to be recommended. Other forms of cultivation will kill many of them. Early cantaloupes and cucumbers nearly always escape serious injury. Later crops of these vegetables may be protected by successive plantings of squash, every two weeks, about four rows to the acre to furnish plenty of squash blossoms upon which the moths may lay eggs. Before the larvae mature in the squash flowers, the blossoms should be gathered and destroyed or the entire vines destroyed as the late planted ones begin to bloom.

Literature

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GLADIOLUS INJURED BY THRIPS

W. E. BRITTON and B. H. WALDEN

During the past few years, the gladiolus has increased in popularity as a garden flower, due no doubt to the fact that it had been easy to grow and had no important insect pests. In fact, the writers have heretofore seen only occasional insect injuries to gladiolus and none of them were severe.

In 1931, however, the plant was severely injured by thrips in many plantations. In some gardens the flowers were completely ruined. The first specimens of plants injured by thrips were brought to the Station on July 14, from Longmeadow, Mass., and from then to the end of the season many samples and reports of injury were received from Connecticut, showing that the pest was present in Fairfield, Hartford, Middlesex, New Haven and New London Counties. Some badly injured leaves and flower buds were received from Bridgeport, July 31, specimens from Meriden, August 28, and Wethersfield, October 3.

In Canada and in Ohio, there was considerable injury to gladiolus in 1930, by a species of thrips that proved to be new to North America, and was described as *Taeniothrips gladioli* by Moulton and Steinweden[1]. We may, therefore, call this species the gladiolus thrips whether or not its identity has been definitely established. Some entomologists believe it to be a species introduced from Europe, in which case it has probably been described under another name. There are also other species of thrips that occur on gladiolus, though perhaps not in great abundance.

The insects live over winter on the corms or bulbs in storage, and the infestations reported in July indicate that the corms may have been infested before planting them. In many gardens the early blooms were not infested, but the late blossoms were often ruined by thrips that evidently came from some other garden after the plants had started into growth.

Thrips were collected on gladiolus from different sections of the state where injury occurred, and mounted on microscope slides. Five different species have been found in this material, and one of them appears to be *Taeniothrips gladioli* M. and S.

Thrips develop most rapidly in dry hot weather. The past two summers have been ideal for the maximum development of these insects, which perhaps may explain why they occurred in such destructive numbers in 1931. Thrips injure the plants by rasping off the surface of the tissue giving the foliage a whitish appearance. After the blossom stalk appears, the thrips are able to find their way under the thin sheath at the base of the buds. They also enter the buds out of the reach of any spray or dust. If only a few individuals feed upon the buds, the injury is often sufficient to ruin the flowers for market. Plate 10 *a* shows the appearance of thrips injury on the leaves and blossom spike. It is obvious that control of the thrips on gladiolus is practically impossible after the insects have worked their way inside the buds. We have not made any extensive tests in the control of this pest. Injury probably can be prevented by spraying the infested plants thoroughly each week soon after the season's growth begins, as recommended by the Ohio Agricultural Experiment Station in the following emergency circular:

"The gladiolus thrips, for the first time, was severely injurious in Ohio in 1930 and the damage has continued the present season.

"The insects injure the foliage by eating away the surface of the leaves. When the flower spike-bud appears, the insects swarm to it and if the infestation is severe the plant may fail to blossom. A mild infestation results in flecked, deformed flowers.

"Of the many spray formulae tested the following has thus far given most promising results:

[1]Canadian Entomologist, 63; 20. Jan., 1931.

Waste sulfite liquor.....9 tablespoonfuls
or
"Lignin pitch".....4½ level tablespoonfuls
Nicotine sulphate.....3 tablespoonfuls
Lead arsenate.....2½ ounces
Water .....5 gallons

"The waste sulfite liquor is a by-product of paper pulp mills and costs but little. It may be obtained in dried form under the name of 'Goulac' from the Grasselli Chemical Company, Cleveland, Ohio; from The American Gum Products Company, 230 Park Avenue, New York; as 'Bindex' from the Champion Fibre Company, Canton, N. C. 'Lignin Pitch' is the common name for the dried product.

"As a tentative schedule it is recommended that the gladiolus be sprayed at weekly intervals until the spike begins to shoot and thereafter, every other day.

"Finally, it should be borne in mind that the foregoing recommendations are tentative and are not issued at this time as the result of a *completed* piece of work. Extensive experiments now under way may modify the formula given."

As has already been explained, the gladiolus thrips lives over the winter on the corms in storage, and may cause much injury before spring if the cellar temperature is above 50°F. At a lower temperature the insects develop very slowly and the injury is comparatively less. As the over-wintering thrips on the corms appear to be the chief source of infestation in the field, the corms should be treated in the fall soon after they are cleaned for storage[1]. In case the storage cellar is detached from the house, calcium cyanide may be used at the rate of about two ounces to each 1000 cubic feet of space, for a period of three hours. As cyanide fumigation does not kill the eggs that are laid in the tissues, a second treatment should be given after the eggs have hatched and the thrips have reached the pupal stage.

Cyanide should not be used in the cellar of any occupied dwelling house unless it can be vacated and thoroughly aired out after the fumigation.

If the grower has a tight fumigating box and can keep the temperature above 60° F., he can use ethylene dichloride-carbon tetrachloride mixture at the rate of 1 pint for each 100 cubic feet, and keep the box closed for 14 to 24 hours. This treatment appears to kill the eggs.

For the grower who has only a few corms, fumigating with flake naphthalene is probably the most convenient treatment. The corms can be placed in tight paper bags and the naphthalene scattered over them at the rate of one ounce to each 100 corms. The tops of the bags should be folded to confine the fumes and kept closed for two or three weeks at a temperature of 60° F., or left for a longer period if the temperature is lower. Corms injured by thrips in storage are shown on Plate 10 *b*.

[1]Florists Exchange, 79, No. 2: 11, 1932.

THE USE OF CALOMEL IN THE CONTROL OF ROOT MAGGOT (HYLEMYIA BRASSICAE BOUCHÉ) ON CABBAGE

ROGER B. FRIEND

Bichloride of mercury ($HgCl_2$) solution has long been a standard method of control of the cabbage root maggot. This method has some defects, however. On light sandy soils some injury to cabbage, cauliflower and brussels sprouts may result, and Clayton (1926) has reported such injury to plants in seedbeds on Long Island. The corrosive effect of bichloride of mercury on metals and its poisonous qualities make it necessary to handle the material with considerable care.

Glasgow (1929) has reported the successful use of mercurous chloride (HgCl), or calomel, as it is commonly called, against the onion maggot, cabbage maggot in cauliflower seedbeds, and carrot rust fly. The material was applied in various ways, but it appeared to the writer that on early cabbage the simplest method of those used was that of dusting with a mixture of 4 per cent calomel and 96 per cent gypsum. According to Glasgow's results on cauliflowers in seedbeds, one application gave 87 per cent clean plants, and two applications gave 100 per cent clean plants, as against 54 per cent clean plants in the untreated plots. Bichloride of mercury treatment (1 ounce to 10 gallons) resulted in 92 per cent clean plants with one application, 97 per cent with two applications, and 100 per cent with three applications. The calomel-gypsum dust thus appears as effective as bichloride of mercury in controlling maggot injury. The writer (Friend, 1931) tried a suspension of calomel in water in 1930, but due to lack of root maggot infestation the results as regards maggot control were inconclusive.

In the writer's experiments, in 1931, Copenhagen market plants were set out in a latin square arrangement, four series of plots to each square. The first series was treated with bichloride of mercury at a concentration of 1-1280 (1 ounce in 10 gallons of water); the second series with a suspension of calomel in water, 1 ounce in 10 gallons; and the third series by dusting the surface of the soil around the plants with a dust consisting of 4 per cent calomel and 96 per cent gypsum by weight. The fourth series was not treated and served as a check. Two sets of plots were used, the first being treated twice (May 1 and May 9) and the second once (May 1).

The heads were cut on all plots and weighed in order to obtain a comparison of yield, and the number of plants that died was also recorded. Two cuttings were made, one on July 7 and 8 of all heads estimated to weigh two pounds or more, and one on July 14 of all heads estimated to weigh 0.5 pounds and more. The infestation was very light, even on the untreated plots, so the results were

not as decisive as could be desired. However, the relative merits of the treatments are indicated in Table 18.

TABLE 18. CABBAGE MAGGOT CONTROL, 1931

Plot A. Treated May 1 and May 9

Yield	$HgCl_2$ 1-1280	HgCl-1-1280	HgCl-Gypsum 4% dust	Check
Heads planted	120	120	120	120
Heads lost				
Maggot	0	0	0	9
Other causes	2	7	4	6
Total	2	7	4	15
Per cent	1.7	5.8	3.3	12.5
Weighed July 8				
Number heads	78	67	74	60
Per cent heads	65.0	55.8	61.7	50.0
Total ounces	3093	2852	2994	2359
Ounces per head	39.7	42.6	40.5	39.3
Relative yield				
Total	100	92.2	96.8	76.3
Per head	100	107.3	102.0	99.0
Weighed July 14				
Number heads	40	46	42	45
Per cent heads	33.3	38.3	35.0	37.5
Total ounces	1118	1483	1435	1375
Ounces per head	28.0	32.2	34.2	30.6
Relative yield				
Total	100.0	132.6	128.4	123.0
Per head	100.0	115.0	122.1	109.3
Total weighed				
Number heads	118	113	116	105
Per cent heads	98.3	94.2	96.7	87.5
Total ounces	4211	4335	4429	3734
Ounces per head	35.7	38.4	38.2	35.6
Relative yield				
Total	100	102.9	105.2	88.6
Per head	100	107.6	107.0	99.7

Plot B. Treated May 1.

Heads planted	120	120	120	120
Heads lost				
Maggot	0	1	0	20
Other causes	4	12	6	13
Total	4	13	6	33
Per cent	3.3	10.8	5.0	27.5

TABLE 18. CABBAGE MAGGOT CONTROL, 1931—*(Continued)*

Plot B. Treated May 1.

Yield	$HgCl_2$ 1-1280	HgCl-1-1280	HgCl-Gypsum 4% dust	Check
Weighed July 7-8				
Number heads	54	48	61	48
Per cent heads	45.0	40.0	50.8	40.0
Total ounces	2014	1929	2643	1910
Ounces per head	37.3	40.2	43.3	39.8
Relative yield				
Total	100	95.8	131.2	94.8
Per head	100	107.8	116.1	106.7
Weighed July 14				
Number heads	62	59	53	39
Per cent heads	51.7	49.2	44.2	32.5
Total ounces	1996	1653	1739	1000
Ounces per head	32.2	28.0	32.8	25.6
Relative yield				
Total	100	82.7	87.1	50.1
Per head	100	87.0	101.9	79.5
Total weighed				
Number heads	116	107	114	87
Per cent heads	96.7	89.2	95.0	72.5
Total ounces	4010	3582	4382	2910
Ounces per head	34.6	33.5	38.4	33.6
Relative yield				
Total	100	89.3	109.3	72.6
Per head	100	96.8	111.0	97.6

Discussion

Of the plots treated twice (Plot A), no plants were lost due to root maggot injury, and only nine plants were lost in the untreated plots. The total loss of plants due to all causes was 15, or 12.5 per cent, in the untreated plots as against 1.7 to 5.8 per cent in the treated plots. The actual loss, therefore, in any of the plots was not great. However, aside from the actual number of plants lost, there are other important considerations involved. Earliness of the crop is important; and the proportion of heads of marketable size at the first cutting, the total weight and average weight per head of this cutting, as well as the total weight and weight per head of the entire crop have a bearing on the effectiveness of the treatment. In estimating the value of calomel its effectiveness should be compared with the untreated check plots and with bichloride of mercury as a standard.

The data obtained from the crop harvested July 8 show a superiority in yield on the part of all treated plots over those not

treated. The bichloride treatment gave the greatest yield, and even though the heads averaged slightly less in weight than either of the calomel treatments, nevertheless all heads were of marketable size and the differences in average head weight would have no significance commercially. The suspension of calomel in water resulted in a total yield of 92.2 per cent of that attained by the bichloride, and the calomel-gypsum dust total was equal to 96.8 per cent of the bichloride yield. The untreated plots yielded 76.3 per cent of the bichloride total. The difference between bichloride of mercury and calomel-gypsum dust is not considered significant, and the calomel suspension was not strikingly different. In practice the two former would be expected to give equally efficient control, but the latter, with 7.8 per cent less yield than bichloride, is subject to some question. Attention should be called to the fact that even though the noticeable root maggot injury was relatively light, the total yield on the untreated plots was significantly less than that on the treated plots. Although the untreated plots lost only 5 per cent of their plants due to maggot injury and only 12.5 per cent due to all causes, still the *total yield on the first cutting* was only 76.3 per cent of the yield of those plots treated with $HgCl_2$. In 1930 the writer (Friend, 1931) obtained an increase in weight per head due to treatment with $HgCl_2$, but the increase in weight per head obtained in 1931, (four-tenths of an ounce on the average), is not significant.

Inasmuch as that part of the crop cut and weighed July 14 included all the remaining heads that had attained a weight of 0.5 pounds or more, it is to be expected that the yield of the bichloride plot, with the greatest percentage of heads cut on July 8, would be least of the four series. This is borne out by the results. However, both calomel treatments slightly exceeded the untreated plots as regards the yield of July 14.

If the total yield of the bichloride series is compared with the others, the untreated series of plots is noticeably inferior and the calomel series are both slightly superior. Compared with each other, the two calomel treatments were about equally effective.

Plot B, receiving one treatment, differs from A markedly in the extent of root maggot infestation, for the loss due to maggot injury was 16.7 per cent in the untreated series. The total loss of plants in this series was 27.5 per cent as against 12.5 per cent in the untreated series of A. There was a much lower yield on July 7-8 throughout all series in B than in A, perhaps due to soil differences, and the calomel-gypsum dust was markedly superior to all other plots in every way at this first cutting. The average weight per head of the untreated series slightly exceeded that of the bichloride series, but in total weight the latter was superior.

In the second cutting, July 14, the average weight per head in the calomel-gypsum series was superior to all others. As would

be expected, the total weight of this series was not the best of the four, but nevertheless it exceeded the untreated series and the calomel suspension series.

The data on total yield of all series show that whereas the bichloride treatments yielded the greatest number of heads, the crop yields in order, greatest to least, were calomel-gypsum dust, bichloride of mercury, calomel suspension, untreated. The untreated series gave an insignificantly greater average weight per head than the calomel suspension. In spite of the heavier root maggot infestation in B than in A, the calomel-gypsum series in the former very nearly equalled that in the latter, there being no significant difference. The bichloride series in B was superior to the calomel suspension.

If the results of all series of both plots A and B are considered, the calomel-gypsum dust is the superior treatment of the three, and all are better than no treatment. These are significant differences even though the root maggot infestation was not heavy. Just why the dust should be superior to the calomel suspension is not quite clear from this experiment. It takes about 1.2 grams of dust per plant per treatment, and this contains about .05 grams of HgCl. About 2.1 fluid ounces of the suspension were used per plant per treatment, and this contained about .002 grams of calomel. The dust contained more than twice as much calomel as the suspension in water, but the water should carry the material better down around the roots. We do not know the effective dose of calomel for maggots, nor what happens to it after the application. The gypsum may have affected the yield to a certain extent.

The use of a calomel-gypsum dust appears to be effective in root maggot control on early cabbage, and two treatments are sufficient. One grower in Connecticut reports excellent results with this insecticide. The material is easy to apply and the cost, including labor, certainly does not exceed that of bichloride of mercury. It is safe to use on plants and lacks the poisonous qualities to man possessed by the bichloride. The use of a suspension of calomel in water is difficult because of the rapidity with which the material settles.

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MISCELLANEOUS INSECT NOTES

Hibernation of sycamore lacebug. When engaged in field work on the European pine shoot moth in Old Lyme, G. H. Plumb observed a large sycamore tree with thousands of lacebugs under the loose flakes of bark. Some pieces of bark were removed and brought to the laboratory. All the lacebugs seemed to be resting on the loose bark with their backs against the trunk and headed in different directions. Plate 11 *b* shows one of these flakes of bark containing about 104 lacebugs. This is the sycamore lacebug, *Corythucha ciliata* Say, which was very abundant everywhere on sycamore in 1931. [W. E. Britton]

Lawns injured by Ochrosidia. On November 12, Mr. Johnson brought to the Station a large number of grubs that had caused severe injury to lawns in Westport. There were three areas, one of about two acres, another of one acre, and a third somewhat smaller area where the grass had been destroyed. These grubs were not all of the same species. A large proportion were *Ochrosidia villosa* Burm., a species not recognized previously in Connecticut. The others were common related forms. [W. E. Britton]

Weevil grubs injure lawns. On June 26, some grubs were received from the Farmington Country Club that were said to devour the grass roots. Dr. Friend visited the place July 3 and collected grubs and beetles from the injured lawn areas. On July 2, grubs and beetles of the same species were received from Devon. Specimens were sent to A. J. Mutchler, of the American Museum of Natural History, who replied that the insect appeared to be *Hyperodes porcellus* Say, but that as the coloration was somewhat different from the specimens in the museum collection, it might prove to be a different species. [W. E. Britton]

Damage by the fruit tree leaf roller. The fruit tree leaf roller, *Cacoecia argyrospila* Walker, has caused severe injury in New York apple orchards and although it is present in Connecticut, we have not known it to cause commercial damage. On June 26, Dr. Garman visited an orchard in Greenwich where foliage and fruit were injured considerably by this insect. The caterpillars had eaten both leaves and fruit, and the appearance of this injury and the adult moth are shown on Plate 12. In Illinois this insect is controlled by a dormant spray of lubricating oil emulsion containing 6 per cent of oil, to kill the over-wintering eggs.
[W. E. Britton]

Curious maggots in soil. On April 6, specimens of curious Dipterous larvae were received from Pomfret Center, with the statement that a spot about 12 feet square in the garden was infested with hundreds of them and that some of them were as

deep as 15 inches. The larvae soon pupated and adults emerged May 2 and 4 and proved to be *Bibio albipennis* Say. Larva, pupa, and adult are shown on Plate 11 *a*. The flies are very abundant during May and early June and may be seen resting upon the leaves of orchard trees, but they are of no economic importance. [W. E. Britton]

Gladiolus corms infested with lily aphid. On May 25, gladiolus corms from Hamden were brought to the Station badly infested with aphids. These aphids were determined as *Myzus circumflexus* Buxton, a species that attacks lilies in greenhouses. It was found that some Easter lilies, after they were through blooming were placed in the cellar near the gladiolus corms. After the lilies had dried out, the aphids evidently migrated to the gladiolus. The owner soaked the corms in nicotine sulfate, 1-400, for 30 minutes before planting, and no aphids were observed on the plants in the garden. [B. H. Walden]

Abundance of springtails in soil. Mr. Lacroix collected some springtails in Suffield, June 13 and 19, 1931. These insects were very tiny but were present in great numbers, often an inch or more deep in the bottom of furrows and hoof prints in the plowed field. Specimens were sent to Dr. J. W. Folsom, of the Bureau of Entomology, who identified the species as *Proisotoma minuta* Tullb., a soil species that often occurs in dense masses where moisture conditions are favorable. It is found in Europe, Canada, and many portions of the United States. It was collected once before in Connecticut at Warehouse Point. [W. E. Britton]

The painted lady or thistle butterfly. The leaves of hollyhock plants are often riddled by gray spiny caterpillars that make a web near the base of the blade. They rest under this web and devour sections of the leaf between the veins. Two lots of specimens were received at the Station on July 11 and 14. Adults emerged from the second lot, July 25, and proved to be the painted lady or thistle butterfly, *Vanessa cardui* Linn. Certain plants had nearly every leaf injured by this insect. Spraying with lead arsenate will protect the foliage and prevent injury. The caterpillar, butterfly and injured leaf are shown on Plate 13. [W. E. Britton]

The pipe vine caterpillar. Wherever the Dutchman's pipe is grown as an ornamental vine in Connecticut, the pipe vine caterpillar, *Laertias (Papilio) philenor* Linn., will be found feeding upon it. This caterpillar reaches a length of about two inches and is dark brown with two rows of red dots along the back, naked except for a row along each side of brown fleshy filaments or protuberances. The cocoon is fastened to the leaf, is yellowish and lavender and about one and one-fourth inches in length. The adult

is a blue-green swallow-tail butterfly with marginal spots or lunules. (See Plate 14 *a* and *b*. Wing expanse varies from 3.5 to 4.5 inches. Spraying the foliage of the Dutchman's pipe vine will prevent defoliation. [W. E. Britton]

Thrips on privet. For the past two or three years a privet hedge on the Station grounds has been heavily infested with thrips. Specimens collected during 1931 represented two species, one of which is undetermined. Dr. C. C. Hamilton, of the New Jersey Experiment Station, compared the other species with New Jersey material, and stated that it was apparently *Dendrothrips ornatus* Jablonowski. Leaves on the hedge showed considerable feeding injury, but no great damage was done by the thrips. *Dendrothrips ornatus* was somewhat more abundant than the unknown species. [N. Turner and G. H. Plumb]

The saddled prominent. In the Report of this Station for 1930, on pages 529 to 532 is an account of an outbreak of the saddled prominent, *Heterocampa guttivitta* Walker. According to the information received at this office, the insect appeared in the same region in 1931, but in much lessened numbers. George C. Kautzman, of Norfolk, wrote July 29, as follows: "The saddled prominent caterpillar is abundant in the maples here, and although I believe less numerous than last year, defoliation is going on, with droppings continually raining down from the trees." Later in the season, the information that I was able to gather indicated that there was no very extensive defoliation by this insect in 1931. [W. E. Britton]

Status of Asiatic beetle. The Asiatic beetle, *Anomala orientalis* Waterhouse, still continues to injure lawns in the Westville section of New Haven and in the central portion of West Haven, except where the lawn areas have been treated with lead arsenate. Specimens and reports of injury are constantly being received. Treatment by the state was discontinued in 1928, but Dr. Friend and Mr. McFarland have continued to advise the owners regarding treatment, and many owners have applied the lead arsenate treatment. The quarantine has not been revised since the issuance of Quarantine Order No. 25, effective April 15, 1930. A few infestations have since been discovered outside the present quarantined area, and it will soon be necessary to revise the quarantine and extend the regulated area to include some of these infestations. [W. E. Britton]

Thrips in greenhouses. During the fall of 1931, thrips were unusually abundant in greenhouses. Inspection of greenhouses in Shelton, Derby, and New Haven showed that calla lilies had been seriously injured by *Heliothrips haemorrhoidalis* Bouché and

Frankliniella tritici Fitch. Carnations were seriously injured by *Thrips tabaci* Lind. Many florists used a commercial preparation containing flake naphthalene and tobacco dust in the soil to control thrips. The material was effective but often caused damage to plants. Cucumbers in the Station greenhouse were seriously injured by *Thrips tabaci* Lind., and frequent sprays of nicotine sulfate and soap reduced the injury. The Federal Bureau of Entomology recommends a spray of two tablespoonfuls of Paris green, two pounds of brown sugar, and three gallons of water for control of greenhouse thrips. [N. Turner and G. H. Plumb]

A new scale insect on beech. During the month of December, 1931, the attention of the writer was called to an infestation of *Phenacoccus serratus* Ferris on American beech in Edgewood Park, New Haven. The species was determined by Dr. Harold Morrison, of the United States Bureau of Entomology. Little appears to be known about this insect, and Ferris in describing it (Canadian Entomologist, 57: 231-232) stated that he had no notes on its appearance in life. The egg-masses are white, oval, about four millimeters long, and were found on the lower part of the trunks and the under sides of the lower branches of the trees. (Plate 15 *a*). They occurred scattered singly or in small groups. The trees were 8 to 12 inches in diameter (breast high) and not heavily infested, so the possible injuriousness of the insect could not be determined in this instance. The writer has not observed the living immature or adult stages. The mature female is about three millimeters in length. The American beech is the only recorded host. [Roger B. Friend]

Emergence records of the apple maggot in 1931. During the summer of 1930, emergence records of adults of the apple maggot, *Rhagoletis pomonella* Walsh, were obtained from apples placed in breeding cages during the fall of 1929. These records were published on page 519 of the Report of this Station for 1930. The records were used as a basis for timing sprays for this pest. The data were given to each County Agent who, in turn, by telephone notified the fruit growers in his county. The fruit growers and the members of the Extension Service thought this information was of enough value to ask that it be continued. More apple maggot infested fruit was collected and placed in breeding cages in the fall of 1930. In 1931, the first adult fly emerged on June 19 and flies continued to emerge until July 18, when the last appeared. This information was sent out over radio station WBZ at Springfield, Mass. This method of notifying the fruit growers was satisfactory except in some of the southern counties of Connecticut where there was a little difficulty in receiving clearly the broadcasts from WBZ. We hope that this will be entirely eliminated in 1932, when the

information will be broadcast over three Connecticut broadcasting stations, WTIC at Hartford, WICC at Bridgeport and New Haven, and WCAC at the Connecticut Agricultural College, Storrs. There will be a broadcast from one or more of these stations daily on timely spray information, not only for this insect, but for any other pests that may be considered of importance to the fruit growers of the state.

EMERGENCE OF APPLE MAGGOT FLIES, 1931

Date of emergence	Number flies	Date of emergence	Number flies
June 19	1	July 6	4
" 20	1	" 7	4
" 22	2	" 8	1
" 23	6	" 9	7
" 24	3	" 10	4
" 26	3	" 11	1
" 27	3	" 12	4
" 29	2	" 13	5
" 30	3	" 14	3
		" 15	3
July 1	6	" 16	1
" 2	2	" 17	1
" 3	3	" 18	1

[M. P. Zappe].

The Chinese mantid. The Chinese mantid, *Tenodera sinensis* Sauss., was reported as quite common in Greenwich, Stamford and vicinity in 1931. For more than 30 years this insect has been established around Philadelphia, and in 1903 a large number of egg-clusters were brought to Connecticut and distributed around New Haven in an attempt to establish the mantid here. Some of these eggs hatched and that summer several mantids were seen. The following winter 25 more egg-masses were obtained and distributed in five different localities. About a dozen specimens were seen in three of these localities the next fall and in one locality a few adults were found the second season. This would seem to indicate that the eggs lived through the winter, and yet the species did not become established in Connecticut. No other reports of the occurrence of this insect in the state had been received until the autumn of 1931. A specimen was brought to the Station September 4 and another September 10 by Mr. Johnson. These specimens were submitted to the Federal Japanese beetle and European corn borer office at South Norwalk, turned over to Mr. Johnson, and by him brought to the Station. At the conference of Connecticut Entomologists, held at the Station, October 30, S. W. Bromley read a paper on this insect, stating that for several seasons it has been present in the vicinity of New York City. In each of the past three seasons, 100 or more inquiries regarding it have been received at the American Museum of Natural History.

The greatest number of inquiries in one day was seven letters and telephone calls. Six specimens in one day were received at the Staten Island Museum. According to Mr. Bromley, the Chinese mantid is now common in Westchester County, New York, and in the southwestern corner of Connecticut. Several mantids were taken in Greenwich, Stamford and South Norwalk in 1931. For the last five years, the winters have been mild, and if there should be a severe winter like that of 1917-1918, it is doubtful if the mantid eggs will survive. Although this insect feeds upon other insects and is considered beneficial, it is known to devour honey bees and some other beneficial species, and its economic status has not yet been fully determined. It is shown on Plate 16 *a*.

[W. E. Britton]

Gladiolus attacked by tulip aphid. On May 26 gladiolus corms infested with the tulip aphid, *Anuraphis tulipae* Boyer, were received from S. A. Edwards of the State Bureau of Markets, with the information that the corms were from one of the larger growers of the state, who had a serious infestation of this aphid. On visiting the grower's place it was found that the storage cellar was warm and in portions of the cellar the humidity rather high. Corms stored on shelves in the drier portion of the cellar were not as badly infested as those stored on the dirt floor. The grower was treating the corms with different preparations recommended by other growers. Infested corms were brought back to the laboratory and treated as follows:

Material	Time of treatment
Laundry soap 1 lb. Water 8 gallons	15 minutes
Red Arrow 5 cc. Water 2000 cc. (1-400)	30 "
Nicotine sulfate 5 cc. Water 2000 (1-400)	30 "
Nicotine sulfate 5 cc. Penetrol, 20 cc. (1-200) Water 4000 (1-800)	15 "
Nicotine sulfate 5 cc. Penetrol 20 cc. (1-200) Water 4000 (1-800)	30 "

After the treatment the corms were rinsed and planted out-of-doors. No injury was observed from any of the treatments and no aphids developed on the new growth. Many of the corms had sprouted before they were treated, and the new shoots appeared to have the life sucked out by the aphids. The roots had not made a normal growth.

Some of the corms that appeared to have been badly injured

by the aphids, were dug up about the time that the shoots should break through the ground. They are shown on Plate 17 *b*. The new shoots were crumpled and too weak to push through the soil and but few roots had developed. Sprouts that were not as badly injured put out leaves that were crinkled, as shown on Plate 17 *a*. Leaves that developed later were normal and the flowers showed no effects of the aphids.

At digging time the corms were somewhat undersized and but few bulblets were formed. The corms planted by the grower grew better than was expected, but were later attacked by thrips.

[B. H. Walden]

The European pine shoot moth situation in Connecticut. For several years after the discovery of the European pine shoot moth (*Rhyacionia buoliana* Schiff.) in the state in 1914 it was a pest in nurseries only, but during the last decade the insect has become seriously injurious to red pine *(Pinus resinosa)* plantations in some sections. Up to the present date the most heavily infested forest plantations and most of the infested nurseries are in the southwestern part of the state, that is, from New Haven County west to the New York border. Light infestations have been found in the northern and east central parts of the state, but the insect appears to have become more recently established in those regions and is not yet serious there.

The situation is of interest to foresters and entomologists in several respects. Due to the prevalence of the white pine weevil and the pine blister rust, the white pine lost favor as a species suitable for reforestation in this state and became largely supplanted by red pine, which had, up to the incidence of shoot moth attack, no serious insect enemies. As a result, several thousand acres of young red pines, most of them not over 25 years old, exist in Connecticut at the present time, and more areas are being planted every year. According to European entomologists, the shoot moth is particularly injurious to young pines, so we have admirable conditions for a bad pest to develop. Moreover, although the insect's native hosts are European pines, particularly the Scotch pine *(Pinus sylvestris)*, in Connecticut the red pine appears to be much more severely affected than any of the introduced European host trees. The absence of infested stands of more than 25 years of age makes it impossible to be certain of the effect of the insect on old trees in this state.

That the insect can severely injure young red pine stands is unquestionable. Several infested small plantations have been so severely checked in growth as to be worthless, and some of them have been cut and the trees burned. The tendency of the insect to date seems to have been to spread rather slowly from centers of dense population, a phenomenon that has both good and bad aspects.

It is not felt that the planting of red pine should be discontinued, but rather that an effort should be made to bring the insect under control if possible. To this end investigations are being conducted to determine the distribution of the shoot moth in Connecticut, its biology, and its relation to various coniferous species, and methods of control that are practicable in forest plantations. The coöperation of owners of red pine plantations has been sought in an effort to keep the insect out of young plantations as long as possible. To this end the trees should be inspected yearly and all infested tips removed and burned. This is only possible in very young stands, but where the infestation is light it does not appear to offer great difficulties. The investigations being carried out at this Station are under the direction of the Departments of Entomology and Forestry. **[Roger B. Friend]**

Notes on the over-wintering and refrigeration of Trichogramma, including biological facts relating to the identity of the various forms. Investigation with breeding Trichogramma during the last 18 months has produced significant results. During the course of these experiments more than 450,000 grain moth eggs and about 200,000 adult individuals of Trichogramma have been examined.

It has been found that Trichogramma will develop and emerge from eggs kept at temperatures as low as 48° F. It emerged in large numbers from material placed in our insectary as late as November 25, and it will frequently emerge from parasitized eggs during mild spells in the course of the winter. A fair percentage of eggs, however, do not produce parasites, probably because they are weakened by cold and death occurs at different periods of their development.

Trichogramma kept too long at a low refrigerator temperature do not emerge, although outside in the insectary they have been wintered successfully from October 23 until May 2. Four days pre-refrigeration development at 80° F. is best for refrigeration of the yellow species.

As reported in a previous paper, there is an important change in the percentage of sexes after refrigeration at 38 to 40° F. No important change occurs at higher temperatures even with variable pre-refrigeration development. The first generation following, however, frequently shows a marked difference. Deformed individuals with poorly developed wings also increase after a period of refrigeration and there is doubtless some weakening effect of cold other than appears from the change of sex ratio. Sex determinations in these tests were made on a basis of abdominal and antennal examinations and special precautions were taken to prevent interference of other factors, such as specific differences or oviposition before fertilization.

A comparison of the effects of refrigeration at 37°, 44°, 46° and 49° F. indicates that 46° is, from a practical standpoint, the most suitable for holding Trichogramma material.

It is apparent finally from this study that the various strains represent two species formerly known as the dark and yellow strains. Inasmuch as Riley has given these forms the names *minutum* and *pretiosa,* and because of the fact that there are outstanding biological differences despite the lack of structural variations it is proposed to accept the names of that author. The more important biological differences appearing during the course of these investigations may be summarized as follows:

(1) *Pretiosa* will not cross successfully with *minutum.*
(2) *Minutum* will not survive refrigeration as well as *pretiosa.*
(3) The sex ratio of *minutum* averages 1 male to 4 or 5 females; that of *pretiosa* 1 male to 2 to 3 females.
(4) The ratio of increase of *minutum* is greater than that of *pretiosa.*
(5) The minimum initial development of *pretiosa* at 80° F. is 6½ days; that of *minutum* at the same temperature is 7¼ days.
(6) The abdomen of the female of *pretiosa* is yellow when reared at about 80° F. or above. That of *minutum* is dark gray or blackish at all temperatures.

There is, however, more than one strain of each species.

A paper giving the above data in much greater detail has been prepared. [J. C. Schread]

PUBLICATIONS OF THE ENTOMOLOGICAL DEPARTMENT, 1931

W. E. Britton

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Donald S. Lacroix

Tobacco insect studies in 1930, Bul. 326, pp. 419-431. Figs. 29-37. 1931.

SUMMARY OF OFFICE AND INSPECTION WORK

Insects received for identification	625
Nurseries inspected	350
Regular nursery certificates (327 nurseries)	340
Duplicate nursery certificates for filing in other states	224
Miscellaneous certificates and special permits granted	148
Nursery dealer's permits issued	127
Shipper's permits issued to nurserymen in other states	243
Certification and inspection	
Parcels of nursery stock	309
Shipments of mountain laurel and other decorative material	309
Narcissus bulbs	43,000
Packages of shelled corn and other seeds	1,858
Blister rust control area permits issued	255
Japanese beetle certificates issued for the shipment of nursery and floral stock and farm products	59,485
Asiatic beetle certificates issued for the movement of soil and plants	2,311
Orchards and gardens examined	169
Shipments of imported nursery stock inspected	19
Cases inspected	142
Plants	1,227,275
Shipments infested	10
Percentage infested	53
Reports to Federal Plant Quarantine and Control Administration	19
Apiaries inspected	1,232
Colonies inspected	10,678
Infested with American foul brood	43 apiaries, 84 colonies
Infested with European foul brood	1 colony
Towns covered by gipsy moth scouts	72
Infestations found	88
Egg-clusters creosoted	3,685
Infestations sprayed	31
Pounds lead arsenate used	75,822
Miles roadway scouted	1,584
Acres woodland scouted	151,061
Letters written on official work[1]	6,146
Circular letters mailed	1,023
Packages sent by mail or express	312
Bulletins and circulars mailed on request or to answer inquiries	6,406
Lectures and addresses at meetings	57

FINANCIAL STATEMENT

The report of receipts and expenditures of the State Entomologist (Insect Pest Appropriation) for the year ending June 30, 1931, may be found in the Report of the Treasurer.

[1]Including 2,263 written from the Shelton and South Norwalk offices, and 96 written from the Danielson office.

INDEX

a. View of road patrol inspection at the Easton-Bethel town line on the Bridgeport-Danbury highway.

b. Method of applying lead arsenate to lawn areas to kill the grubs of the Japanese beetle. View in Hartford.

JAPANESE BEETLE CONTROL

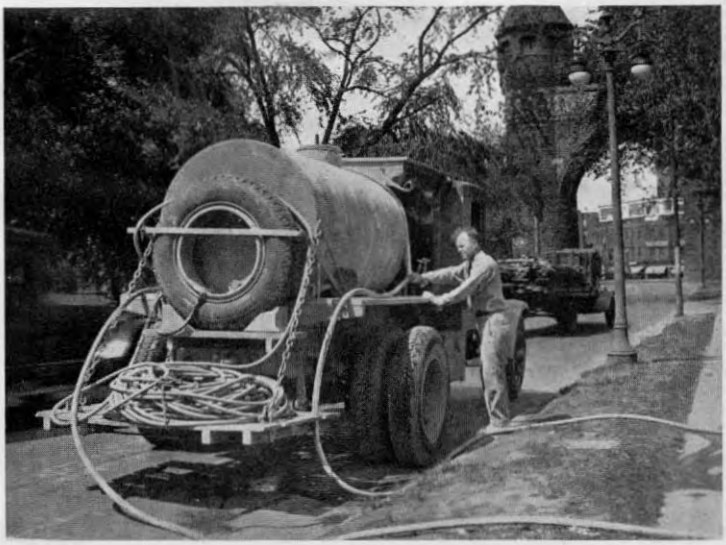
PLATE 7

a. View in Hartford, showing application of lead arsenate to lawn areas to kill the grubs of the Japanese beetle.

b. View in Bushnell Park, Hartford, showing how water is applied to wash the lead arsenate off the grass and into the soil.

JAPANESE BEETLE CONTROL

a. View of lawn, showing at the right where lead arsenate has been applied but not washed in.

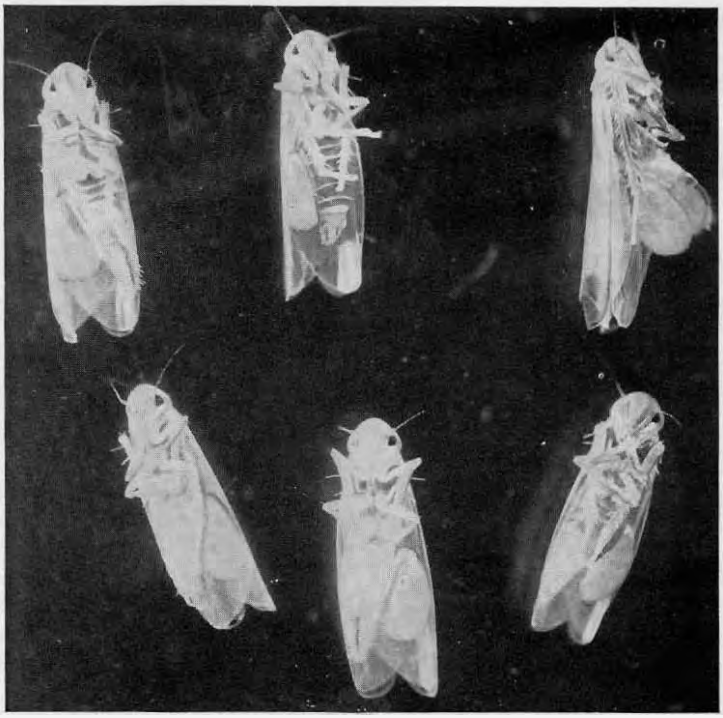


b. View of power sprayer outfit used in treating lawns with lead arsenate.

PLATE 9

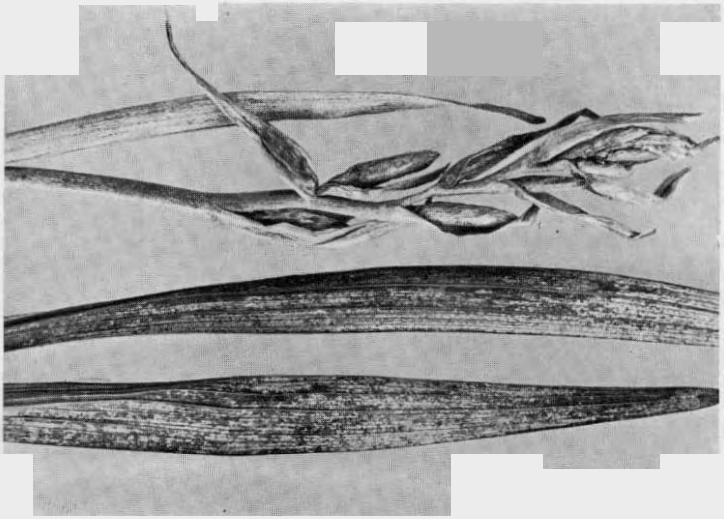
a. Egg blisters on twig, six times enlarged.

b. Eggs in twig with outer bark removed, six times enlarged.

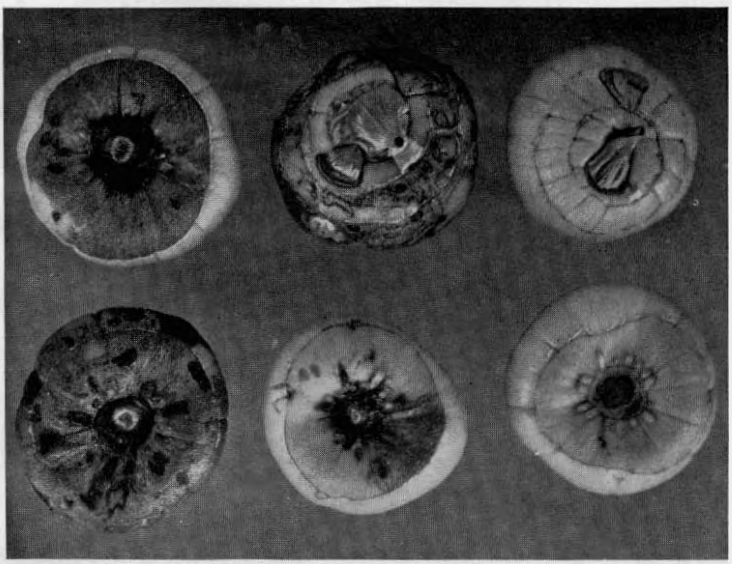


c. Adult leafhoppers showing parasites, about ten times enlarged

WHITE APPLE LEAFHOPPER



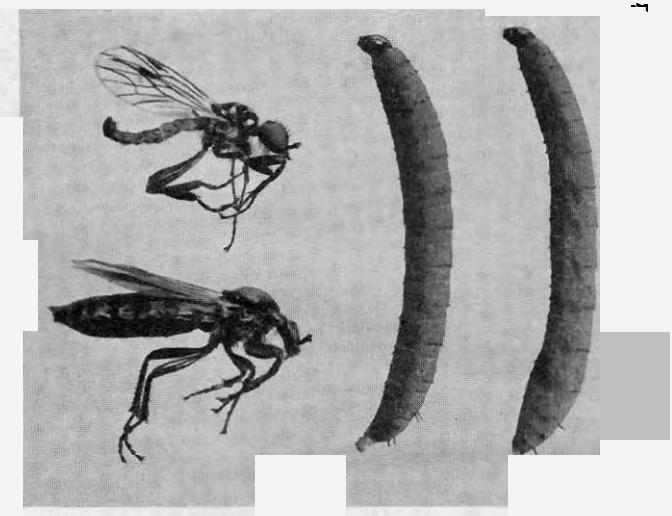
a. Injury to foliage and flower spike by thrips, somewhat reduced



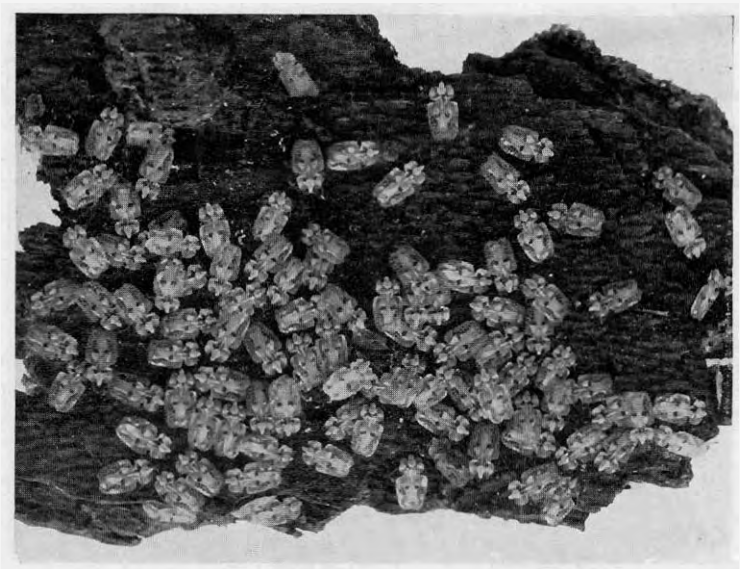
b. Gladiolus corms injured in storage by thrips, somewhat reduced.

GLADIOLUS THRIPS

PLATE 11

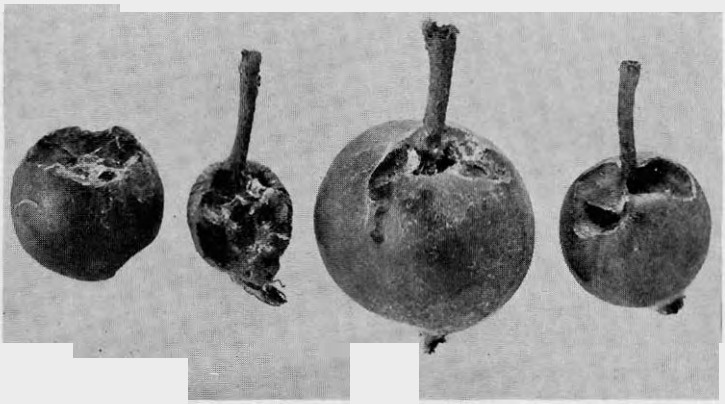


a. Adults and larvae of *Bibio albipennis,* twice enlarged.

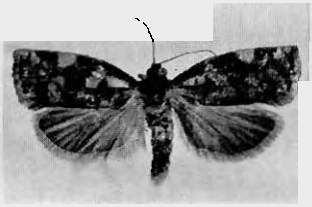


b. Sycamore lacebug, 104 under bark, twice enlarged.

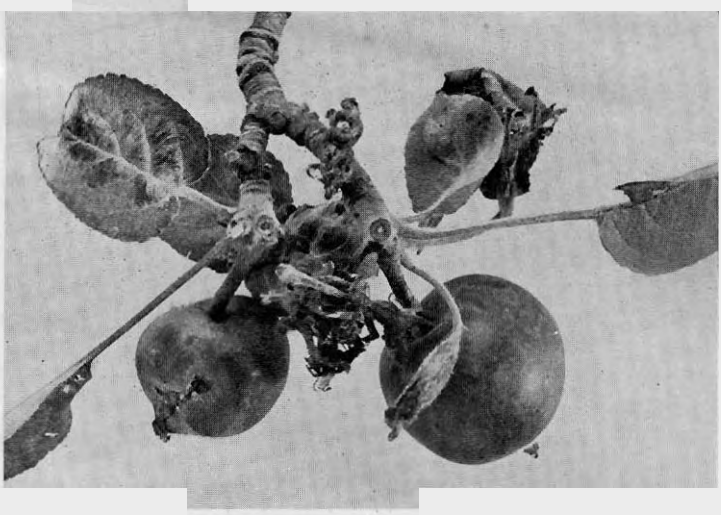
BIBIO ALBIPENNIS AND SYCAMORE LACEBUG



a. Young apples eaten by larvae of fruit tree leaf roller, natural size.



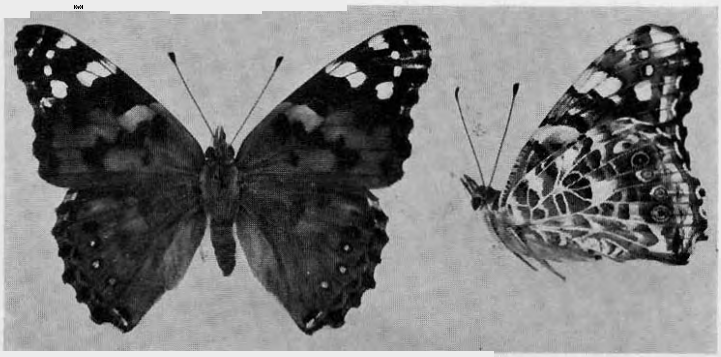
b. Adult moth, twice enlarged



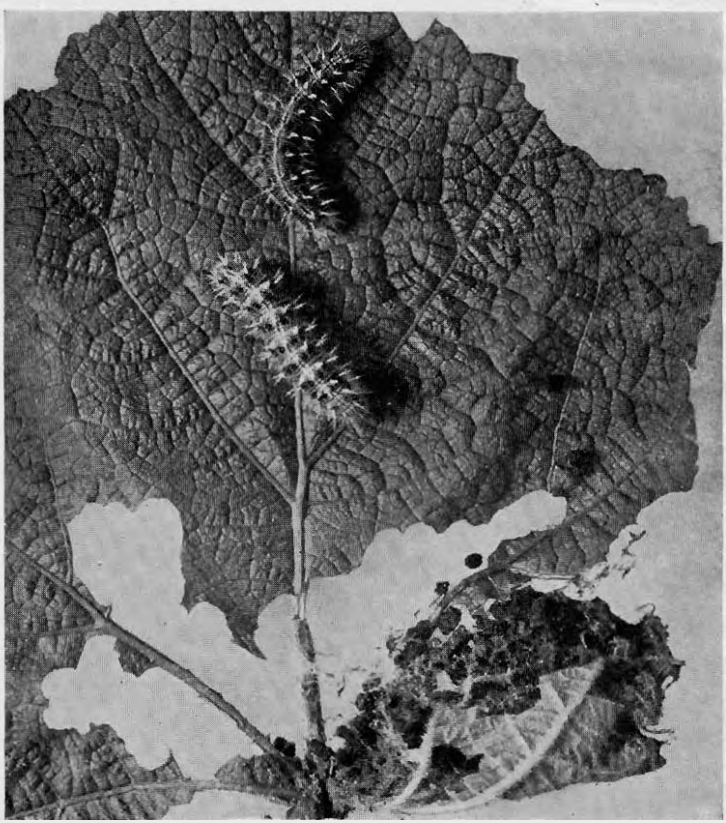
c. Fruit cluster showing injury to leaves and fruit by larvae, natural size.

FRUIT TREE LEAF ROLLER

PLATE 13

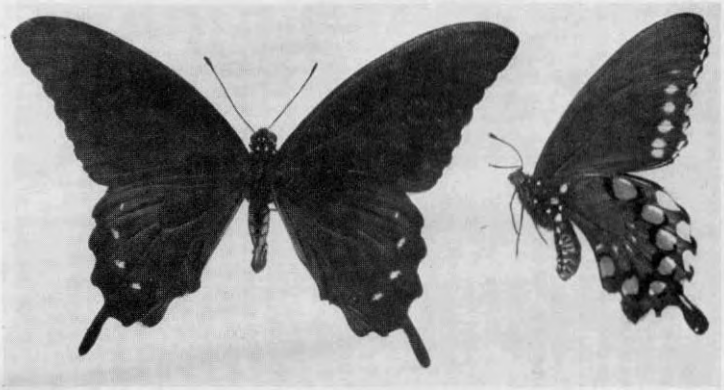


a. Painted lady or thistle butterfly, under side at right, natural size.

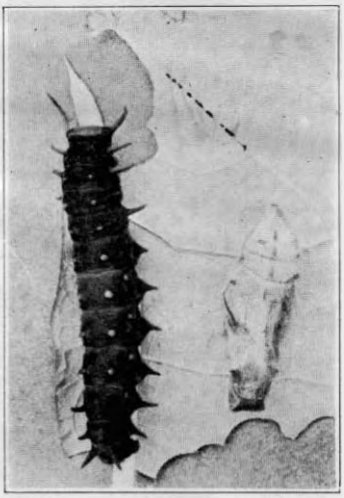


b. Larvae of painted lady or thistle butterfly showing injury to hollyhock leaf, natural size.

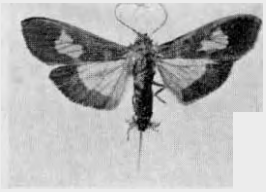
PAINTED LADY OR THISTLE BUTTERFLY



a. Pipe vine swallow-tail butterfly, under side at right, somewhat reduced.



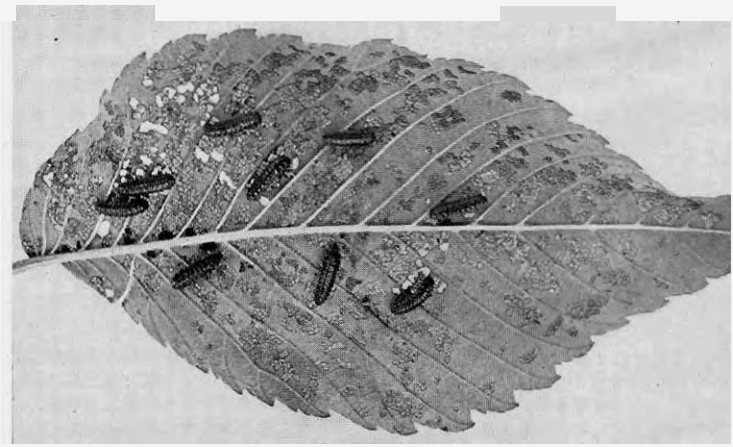
b. Larva and cocoon of pipe vine swallow-tail feeding upon Dutchman's pipe vine, natural size.



c. Pickle worm moth, natural size.

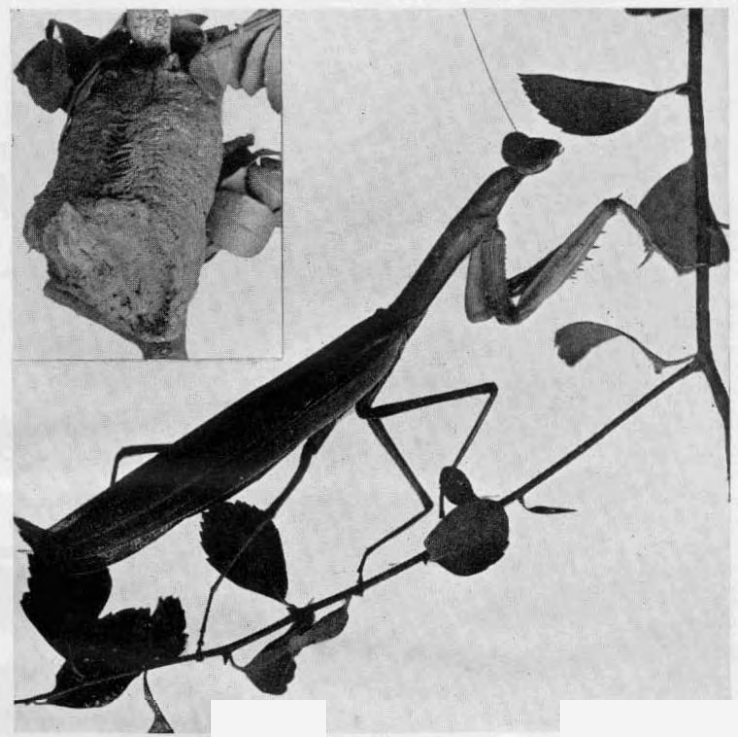
PIPE VINE SWALLOW-TAIL AND PICKLE WORM

a. Scale insect *Phenacoccus serratus*, on beech, somewhat reduced.



b. Larvae of elm leaf beetle on under side of leaf, natural size.

SCALE INSECT ON BEECH AND ELM LEAF BEETLE

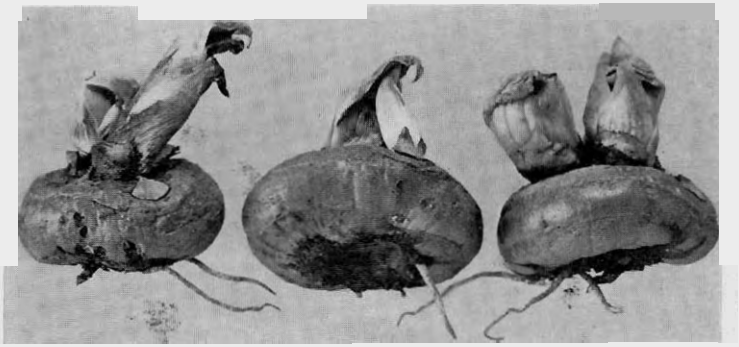


a. Chinese praying mantid, egg-cluster at upper left, slightly reduced.

b. Gladiolus corms injured by bulb aphid, slightly reduced.

CHINESE PRAYING MANTID AND APHID INJURY TO GLADIOLUS

PLATE 17



a. Gladiolus sprouts crumpled and distorted, unable to push out of the ground, injured by bulb aphid, slightly reduced.

b. Gladiolus leaves crumpled after growth was well started, injured by bulb aphid, slightly reduced.

GLADIOLUS INJURY BY BULB APHID