

REPORT ON INSECTS INJURIOUS TO GARDEN CROPS IN FLORIDA.

By WM. H. ASHMEAD. *Special Agent.*

LETTER OF TRANSMITTAL.

JACKSONVILLE, FLA.,

September 2, 1886.

DEAR SIR: I have the honor to submit herewith, in pursuance to your instructions, my report on "insects injurious to garden crops" in Florida, comprehending field-work and studies on these pests from May 15 to August 31, 1886.

My time was too limited to do full justice to the subject: moreover, it will take several years of the most laborious, painstaking industry to thoroughly work up the life histories of the destructive insect pests affecting our garden crops in this State.

Yours, very respectfully,

WM. H. ASHMEAD.

Prof. C. V. RILEY,
U. S. Entomologist, Washington, D. C.

INTRODUCTORY.

The insects depredating "garden crops" in Florida are legion, and the time at my disposal, May 15 to August 31, was too limited to begin to do the subject justice.

Daily rains, too, from latter part of June and all during July greatly interfered with my field-work. During the months of March and April early vegetables are raised in great quantities for northern shipment and consumption, and it is then that the greatest activity exists among certain destructive pests depredating these crops. That is the time investigation should begin. However, considerable work has been accomplished, and in the following pages will be found descriptions of some of the more injurious insect pests injuring these crops; moreover, to make the report of practical value to our vegetable growers, I have given the best remedies known, extracted principally from the writings of Professors Riley, Fitch, Lintner, Packard, Forbes, Thomas, &c.

INSECTS AFFECTING THE CABBAGE.

Probably there is no garden crop in Florida that is so preyed upon and so seriously threatened from the attacks of insect pests as the cabbage and its numerous varieties.

To well-known imported European insect pests, now thoroughly established here and depredating this crop, may be added many indigenous

species that attack and destroy it in different ways, and the injury and loss is very great.

Necessarily I have given considerable time and study to unraveling the life histories of some of the more important ones, giving them that prominence in my report that their importance to the grower seem to warrant.

THE CABBAGE PLUSIA.

(*Plusia brassicae* Riley.)

This is one of the most serious and destructive of cabbage insects. Prof. C. V. Riley first described it in his Second Missouri Report, 1870, page 110.

Distribution.—While, undoubtedly, originally indigenous to the Southern States, it is now very generally distributed over most of the Eastern and Western States. In U. S. Agricultural Report for 1883, Professor Riley states that he has received it from Mississippi, Georgia, Florida, the Carolinas, Alabama, Texas, New Jersey, Missouri, Kansas, Nebraska, Virginia, and Maryland.

Food Plants.—The food plants of the larvæ, as given in same report, are Cabbage, Kale, Turnip, Tomato, Mignonette (*Reseda*), Dandelion (*Taraxacum*), Dock (*Rumex*), *Crepis*, *Chenopodium*, Clover, *Senecio scandens*, Lettuce, and Celery. Professor Riley also says: "We have also found it in Florida feeding upon the Japan Quince (*Cydonia japonica*), and it has been found in Washington upon same plant."

Life History.—The life history of this insect is treated in the Annual Report of the Department for 1883, pp. 119-122, and it is figured in Plate I, figs. 2 and 2a, and Plate XI, figs. 2, a, b, c. The different stages are described in Professor Riley's Second Missouri Entomological Report, pp. 111-112.

Number of Broods.—Professor Lintner, State Entomologist of New York, in treating of this species in his second report, page 92, says: "In its more northern extension there are two annual broods, for, from larvæ taken in August, after about two weeks of pupation, Dr. Thomas has had the moths emerge on the 1st of September, which deposited their eggs for a second brood in October. In the Southern States there are probably four broods, for Mr. Grote took examples of the moths in Alabama during the last of February."

Here in Florida there are certainly not less than six broods, for I have taken the moths every month but the winter months, November, December, and January.

Its Injuries.—Not a cabbage patch visited by me this spring and summer but was more or less damaged by the attacks of this terrible cabbage pest, and the injury it does and the loss sustained by the trucker is immense.

The very young begin by eating the fleshy portion of the leaves; as

they grow in size and strength they gnaw irregular holes through the leaves, until they are completely riddled or honey-combed and the cabbage rendered thereby unmarketable.

Natural Enemies and Parasites.—Comparatively few natural enemies have been observed preying upon this insect, although carabid beetles and others are supposed to destroy it at the North.

A European chalcid fly, *Copidosoma truncatellum* Dalman, has been reported as parasitic on this species at Washington, by Mr. L. O. Howard; twenty-five hundred and twenty-eight specimens of this parasite were actually counted as coming from a single parasitized worm.

Professor Riley has also bred an ichneumon fly, *Apanteles congregatus* Say, from larvæ.

Here, in a single instance, I bred from a chrysalis an ichneumon fly (*Limneria*, sp.) a common parasite of the Cabbage Plutella, and it will be found treated further on under the parasites of that insect.

From the egg, however, I bred a pretty little chalcid fly (*Trichogramma pretiosa* Riley). It was first described by Professor Riley in Canadian Entomologist Vol. XI, page 161, from specimens bred from the eggs of the Cotton Worm (*Alctia argillacea* Hübn.).

Besides the above parasites, three larvæ were brought under my observation, attacked by the parasitic fungus (*Botrytis Rileyi* Farlow).

REMEDIES.—*Pyrethrum.*—Professor Lintner recommends pyrethrum: "A tablespoonful of good fresh powder, diffused through 2 gallons of water and sprinkled over the plants, would destroy the larvæ."

Hot Water.—Every worm visible upon the cabbages may be killed by the use of water at the temperature of 130° Fahrenheit, or 55° centigrade. The water may be boiling hot when put in the watering-can, but it will not be too hot when it reaches the cabbage leaves. The thick fleshy nature of the leaves enables them to withstand considerable heat with very little injury. The sacrifice of a few heads of cabbage will soon teach an experimenter how far he can go with the hot water. It may be sprinkled over the plants from a fine rose watering-can or poured on with the sprinkler removed. If it is very hot it will color some of the leaves, but even where the cabbage is considerably scorched it will recover and renew growth from the heat. Prof. C. V. Riley).

Kerosene Emulsion.—The kerosene emulsion, as formulated by Mr. H. G. Hubbard for scale insects, will also be found valuable for cabbage-worms.

Lime and Carbolic Powder.—This is also good. Take 20 parts superphosphate of lime, 3 parts fresh air-slaked lime, and 1 part carbolic powder; mix, and scatter a small quantity upon each cabbage head three or four times at short intervals about three days apart. The carbolic powder is made by taking sawdust and thoroughly impregnating it with carbolic acid.

THE CABBAGE PLUTELLA.

(Plutella cruciferarum Zeller.)

Second only in importance to the Cabbage Plusia is another cabbage worm, the "Cabbage Plutella," the larva of a small moth, and which may easily be confounded with the very young larva of the Cabbage Plusia.

This insect was treated at some length in Professor Riley's Annual Report as Entomologist to the Department for 1883, and it will therefore be unnecessary to go into detail here. I may state, however, that while at the North there are probably but two annual generations, there are at least four here in Florida. The larvæ are quite plentiful on cabbage from the last of February to July, and again in the fall. The damage done is very similar to that of the Plusia and is almost as great, although it seldom attacks other than the outer leaves.

I have bred a parasite, additional to those mentioned by Professor Riley, which agrees with the description of Cresson's *Limmeria obscura*.

THE CABBAGE APHIS.

(Aphis brassicæ Linn.)

The Cabbage Aphis (*Aphis brassicæ*) first described by Linnaeus, in his "Systema Naturæ," is quite widely spread throughout this country and Europe. It was undoubtedly imported into this country at a very early day, for Dr. Fitch shows, by reference to the Transactions of the New York State Agricultural Society for 1791, that it was already known as a cabbage pest at that early date, and at this day it has spread to most parts of the world where the cabbage is cultivated.

Food Plants.—It is found on the Turnip, Raddish, Field-ress (*Isatis tinctoria*), Shepherd's-purse (*Capsella bursa-pastoris*), Charloeh (*Brassica arvensis*), Cabbage, and other cruciferous plants.

Here I found it on Cabbage, Turnip, and Raddish.

ITS LIFE HISTORY.—*The Young.*—These are oval, about .01 inch in length, and of a greenish-yellow color, without the mealy coating of the older ones.

Buckton, the British authority on the Aphididae, thus describes the different forms:

Apterous Viviparous Female.—Body long, oval; plentifully covered with a whitish mealy coat, both on the upper and under sides. When this is removed by a drop of spirits of wine the body below is grayish-green, with eight black spots ranged down each side of the back, which increase in size as they approach the tail. Antennæ green with black tips, shorter than the body. Eyes and legs black. Cornicles very short and black. Tail also small and black.

Winged Oviparous Female.—Head, neck, and thoracic lobes black. Antennæ and nectaries dark brown. Eyes black. Rest of the body yellowish-green. Abdomen with a row of fine punctures on each lateral edge, with several obscure transverse dorsal marks. Legs dusky brown, pilose. Tail dark green or brown; hairy. Cor-

nicles short and brown, as also is the tip of the rostrum. This last organ reaches to the second coxae. Wings rather short, with stout coarse veins and stigma.

Its Injuries.—The injuries this species does are more apparent in early spring and late fall than at any other time, for it is then that they are most plentiful, and less subject to the attacks of their numerous natural enemies.

They are found in colonies, on the upper and lower surface of the leaf; often hidden in the wrinkles and folds of the leaf, deep down at its base and on the leaf-stalk.

Buckton says: "Both the upper and under sides of the foliage of which last plant (*Brassica oleracea*) it often crowds in such numbers that the leaves become hidden by the living mass. Indeed sometimes, weight for weight, there is more animal than vegetable substance present. The leaves then become putrid, offensive in odor, and quite disgusting to the eye."

It is seldom that plants are so badly infested in Florida as described by this author, although some years ago I did see old cabbage-stalks that had been left to seed in an old cabbage patch so affected.

Every stalk was literally covered, promiscuously piled one upon another, with living, pumping, slimy aphids, rendered such by the exuding sap of the plants. I was unable to touch a portion of the stalk without my fingers being covered with the slimy, viscid mass.

Natural Enemies and Parasites.—Fortunately, in Florida, the species has very many natural enemies and parasites which keep it from increasing very rapidly.

In Europe, too, it has several parasites. Buckton mentions a *Coruna*, a *Ceraphron*, and a *Trionyx* (*T. rapæ* Curtis) as having been bred from it in Europe; also "several species of Syrphidae and Ichneumonidae act effectually as checks upon the increase of *A. brassicæ*. The larvae of the former dipterous flies, living in the midst of such plenty, soon gorge themselves and become of great size."

Trionyx rapæ Curtis has also been bred from it in this country. It was received at the Department February 27, 1880, from Norfolk, Va., and redescribed by Mr. Cresson in the Annual Report, U. S. Department Agriculture for 1879, page 260, as a new species, *Trionyx piceus*. Professor Riley bred it at Saint Louis, Mo., as early as 1871, and I have bred it here in great quantities in May, June, and July.

It is one of the principal checks in keeping this pest within bounds, and but few of the Aphids escape its sting.

But there are other parasites; and below I give descriptions of several others bred here which are apparently new and as yet undescribed.

The rearing of a parasitic Cynips from this species is quite interesting, inasmuch as the habits of but few of our species are known. Up to the present time *Allotria avenæ*, *A. tritici* Fitch, and *A. lachni* Ashm. are the only Cynipids bred from Aphids in North America.

THE CABBAGE APHIS ALLOTRIA—*Allotria brassicae* n. sp.—FEMALE.—Length .05 inch. Black, highly polished, face and vertex of head testaceous; cheeks broad, convex; antennae 13-jointed, long, pale yellowish-brown or yellowish towards base, becoming brownish or infuscated at tip; thorax smooth, parapsides distant; scutellum small, round, convex, with a deep transverse groove at base; wings clear, pubescent and fringed with short cilia; veins yellowish, the radial area closed; abdomen globose, with the second segment but slightly longer than the third, highly polished black, but more or less testaceous at base and at vent, and a clump of whitish hairs at base; legs honey-yellow; in dry specimens tawny-yellow.

MALE.—The male is of the same size or slightly smaller than the female, and is easily recognized by the 14-jointed antennae; the third, fourth, and fifth joints almost equal in length, and all are excised outwardly; the testaceous spot on vertex of head is not so apparent; the pleura are more or less testaceous and the abdomen is ovate.

Described from several specimens bred from June 6th to July 15th.

THE CABBAGE APHIS PACHYNEURON—*Pachyneuron aphidivora* n. sp.—FEMALE.—Length .04 to .05 inch. Head metallic green suffused with purple and purplish black on vertex; shagreened, the sculpture coarser beneath eyes; mandibles large, tridentate; eyes purplish-brown; antennae brown, pubescent, scape and pedicel darker; thorax purplish-black with bronzy and cupreous reflection, finely reticulately sculptured; scapulae golden green; scutellum prominent, convex, rounded; meta-thorax finely wrinkled; abdomen flat, oval, blue-black, metallic at base and with bronze tinges towards apex, darker beneath; wings hyaline, iridescent, pubescent excepting at base; veins pale yellow, the thickened marginal vein brownish, the stigmal slightly longer than marginal; along outer edge are seven long hairs; legs pale yellowish, coxae black, anterior and middle femora dusky near base and along upper and lower surface, at least two-thirds their length.

Described from several specimens bred June 6th.

THE CABBAGE APHIS ENCYRTID—*Encyrtus aphidiphagus* n. sp.—FEMALE.—Length .06 inch. Blue-black. Head shagreened, face and mouth parts blue, the facial impression is very deep, eyes brown; ocelli region greenish; antennae brown; thorax shagreened in wavy curved rugosities, hind margin metallic green; abdomen bronzed, blue-black; wings hyaline, marginal vein short; legs honey-yellow, all femora brown except at tips, a large brown blotch near base of tibiae, terminal tarsal joints dusky.

Near *Encyrtus subtilis* Howard but the color of the legs will at once distinguish it. Described from several specimens.

THE CABBAGE APHIS SYRPHUS FLY—*Allograpta obliqua* Say.—The larva or maggot of this fly has been taken feeding on the "Cabbage Aphis," and below I give description of its various preparatory stages:

The Egg.—Pearly white, long oval: .03 inch in length, deposited on the leaves among the Aphids.

The Maggot.—It is difficult to distinguish this from many other Syrphid larvæ. The full grown larva measures .25 inch in length, cylindrical, tapering anteriorly to point; it is perfectly smooth, a translucent green, and the viscera are plainly discernible, variously shaded, dark green, yellowish or brownish; the jaws are black; the air vessels, which are visible on either side through the body walls, become contiguous on last segment, where they are connected externally with two small warty spiracles.

The Puparium.—The puparium into which the maggot transforms resembles a cone, with the side attached to the leaf, flattened and held in place by a viscid substance secreted by the larva; its anterior end broad and well rounded, gradually narrowing posteriorly; at the end are still to be seen the two warty tubercles. Color yellow-brown, with occasionally darker shadings.

From the puparium of this fly I have bred the following parasite:

THE SYRPHUS FLY, PACHYNEURON—*Pachyneuron allograptæ* n. sp.—FEMALE.—Length .08 inch. Black, rather coarsely punctate, with a slight metallic luster. Head large, face and cheeks full; eyes brown; antennæ brown, scape rufous; legs tawny yellow, a large brown blotch on fore and middle femora, while the hind femora are almost entirely brown; abdomen flattened, oval, shiny black; wings hyaline, veins pale brown; the bristles on submarginal vein are not long and are difficult to count.

MALE.—Length .06 inch, otherwise similar to female. Described from several specimens. The large size of this species and color of legs will distinguish it from others in our fauna.

Besides the above parasites there is a small Coccinellid that preys on the Cabbage Aphis, viz, *Scymnus cervicalis*.

OTHER INSECTS FOUND ON CABBAGE IN FLORIDA.

A Centipede (*Julus multistriatus*) Say, a Cricket (*Tridactylus minutus* Scudder), the Southern Cabbage Butterfly (*Pieris protodice* Boisd.), the Large Cabbage Butterfly (*Pieris monuste* L.), the Cabbage Mamestra (*Mamestra chenopodii* Albin.), the Zebra Cabbage Worm (*Ceramica picta* Harris), the Cabbage Pionca (*Pionca rimosalis* Guen.), the Cauliflower Botis (*Botis repetitalis* Grote), the Harlequin Cabbage Bug (*Murgantia histrionica* Hahn.), and others.

INSECTS AFFECTING CORN.

The lateness of the season at which I began my investigations precluded me from studying insects depredating this crop in its earlier growth; consequently nothing can be reported of the cut-worms and borers that do so much injury to this crop in early spring.

THE CORN WORM.

(*Heliothis armigera* Hübn.)

This well-known insect has been very plentiful and injurious in Florida during the past season. Not a field of corn was free from its attacks, and but few perfect ears could be found that were not bored into by this pest.

From ears taken from a field near Jacksonville I obtained from eight to a dozen worms in each ear, and out of the whole patch hardly an ear could be found that had less than two or three worms in it.

The insect is treated in full in the Fourth Report of the U. S. Entomological Commission, and a repetition of its life-history, habits, and remedies are unnecessary here.

Its Injuries.—Enormous injuries are committed by this worm, whole fields of corn being almost entirely destroyed by it. The eggs are laid on the leaves, and the young larvæ, which hatch therefrom, begin by eating the leaves, but they soon leave these and bore into the tender ears, gnawing and eating them in all directions, so that frequently hardly a perfect ear can be found. At times it is also found at the

base of the tassel, feeding on the accumulated saccharine juice, found there, just before the tassel emerges from its sheath.

The worms will not only gnaw irregular burrows and feed on corn while in the milk, but the mature larvæ are known at times to continue feeding on mature hard corn.

I have taken on corn two hemiptera or bugs which probably prey on the worm, although not detected in the act—the Wheel Bug (*Prionidus cristatus* L.) and *Euschistus servus* Say. From the egg I bred *Trichogramma pretiosa* Riley, already noticed; but no other parasite has been bred from it by me.

THE CORN MINING FLY.

(*Diastata* sp?)

A mining fly larva is quite frequently met with, making long irregular mines on corn leaves, and while I have not been able to rear the perfect fly, yet I am satisfied it is the same species mentioned by Prof. Comstock, in U. S. Agricultural Report for 1880, page 245, as *Diastata* sp.

Several specimens of a parasite, agreeing tolerably well with Mr. Howard's *Entedon diastata*, reared from it at the North, were also bred from it here.

MISCELLANEOUS CORN INSECTS.

A Hemipteron (*Oebalus pugnax* Fabr.) was found in considerable numbers feeding on corn pollen, along with a Capsid and several flies. A fly (*Ortalis* sp.) is common on the stalk, but was not observed to do any injury. A common beetle (*Allorhina nitida* Linn.) was taken, with head immersed in the ear, feeding on corn while in the milk.

OTHER INSECTS INJURING CORN IN FLORIDA.

The following insects also injure corn here: The Corn-stalk Borer (*Diatraea saccharalis* Fabr.); the Corn Bill-bug (*Sphenophorus robustus* Horn.), and the Angoumois moth (*Gelechia cerealella*) and several Cut Worms. From the tassels I have taken the larvæ of *Nola sorghiella* Riley, and in the crib the Corn Weevil (*Calandra granaria*).

INSECTS AFFECTING THE TOMATO.

The cultivation of the Tomato for Northern markets is a rapidly growing industry in Florida, particularly in the southern portions of our State: and thousands of boxes are now forwarded by our growers to Northern commission men every season.

It behooves us, therefore, to keep a watchful eye on the insect depredators of this fruit, for we may naturally expect, with the extension of any horticultural industry, a corresponding increase of insect pests.

Fortunately, no serious damage done this plant by insects has been reported this season, and, while I have been unable to visit West and

South Florida, the sections in which the Tomato is more extensively cultivated, yet studies on insects infesting it in gardens near Jacksonville will, I feel assured, prove of interest.

THE TOMATO WORM.

(*Sphinx Carolina* Linn.)

This is a well-known insect, common in all tomato patches, although the moth into which it transforms is seldom seen, and remains totally unknown to the great majority of our farmers. When you tell them that the worm will change into a large moth, nine times out of ten they express surprise and think it a most wonderful piece of information.

Distribution.—It is quite generally distributed throughout the United States, Mexico, the West Indies, and is not uncommon in South America.

Food Plants.—It feeds on Tomato, Potato, Jimson weed (*Datura stramonium*), Egg-Plant, Tobacco, and other plants. I took specimens the past season feeding on Poke-berry (*Rivina lavis*).

ITS LIFE HISTORY.—*The Egg.*—The egg is spherical, perfectly smooth, and green or yellowish-green in color; diameter about .05 inch.

The Larva.—When full grown it measures over three inches in length. The head and body are dark green, interspersed with greenish-white dots; it is transversely wrinkled; oblique white or greenish-white lateral bands extend from dorsum to spiracles, edged above with bluish and short transverse black lines. The spiracles, excepting the first and last, are blackish, with a yellow dot above and below, all edged with blue, the first and last orange yellow. The shield and terminal prolegs edged below with yellow; the caudal horn is reddish-brown towards tip, and the feet are white, edged with black.

The Pupa.—Length one inch and a half. Dark reddish-brown, with coarse punctures on abdominal segments, and a detached cylindrical thick tongue-case, not quite reaching to tip of abdomen.

The moth is a mottled gray species, with orange spots along the body, and has too often been figured and described to need description here.

Its Injuries.—When plentiful the injury done is considerable, and great care should be taken to remove and destroy them. They eat the leaves and tenderer and terminal shoots, frequently stripping the plant bare, whereby the plant is unable to breathe or mature fruit.

Natural Enemies and Parasites.—I have observed a species of Wasp carrying off the young worms to provision its nest. It is also probable that the Microgaster and Blacas that attack its nearest ally (*Sphinx 5-maculata*) will be found parasitizing this worm.

A Tachina fly, a species of *Mascicera*, has been bred from it in the North by Prof. Riley (Fourth Missouri Entomological Report, page 129). In June I bred from its eggs *Trichogramma pretiosa* Riley, a general egg parasite already noticed, and a species of *Teleas*. Of the former three to six specimens issued from each egg; from the latter two to four.

I submit a description of the Teleas, which is apparently new:

THE SPHINX EGG TELEAS—*Teleas sphingis* n. sp.—Length, .04 inch. Black, smooth, and polished. Head large, much broader than thorax; antennae 12-jointed, dark brown, sparsely pubescent, the scape barely reaching to the head; pedicel much stouter and larger than first funicle joint, which is small; other joints slightly increase in size to club, which enlarges and widens considerably, and comprises five joints; the antennae in male are more flagellate. The thorax is ovate, smooth, convex, and sparsely covered with microscopical pubescence.

Under a very high power the head and thorax show a microscopical reticulated scratched surface.

No parapsidal grooves: the scutellum is separated by a deep groove at base and has some wrinkled ridges; metathorax rugose. The abdomen is very flat ovate, and somewhat carinate laterally; on first segment there are three deep transverse, punctate grooves, and the second segment occupies most of the upper surface; surrounding the tip are a few hairs.

Legs clavate: femora and coxae black or very dark brown; tibiae brown, with tips; tarsi and trochanters yellowish or tawny; wings hyaline, hairy, and with a distinct, rather long, stigmal vein.

Described from numerous specimens bred in July.

Remedy.—For destroying this worm no better method need be wanted than hand-picking.

The worms are large and conspicuous, easily seen, and no difficulty will attend their destruction. The best time for searching for them is in the early morning and evening; during the middle of the day the majority of them will be found hidden under trash and in the ground at the foot of the vine.

THE TOMATO-STALK BORER.

(*Gortyna nitela* Guen.)

This insect is comparatively rare in Florida, although I have noticed it several times the present season. It has been so often treated in the reports and in popular articles as to need no extended notice here.

THE TOMATO APHIS.

(*Megoura solani* Thomas.)

In some cases brought under my observation this year, this Aphid did considerable damage to tomato vines, particularly in the early spring.

Distribution.—It is pretty generally distributed throughout the United States, although it has not been reported, that I am aware of, west of the Rocky Mountains.

Its Natural History.—Prof. Cyrus Thomas described the species in the Eighth Illinois Report as follows:

Winged Female.—Antennae 7-jointed, a little longer than the body; first and second joints short; third and seventh longest, nearly equal; fourth a little shorter than the third; the fifth not quite as long as the fourth; sixth about half or less than half the length of the fifth; tubercles prominent. Honey tubes extending beyond the abdomen, excessively enlarged in the middle, and expanding at the tip in trumpet

shape. Tail of moderate length, about one-third as long as the honey tubes, conical. Wings as usual in *Siphonophora*: fourth vein strongly and regularly curved; second fork about equally distant from apex and third vein; stigma elongate, slender and pointed, size large.

General color greenish; tail greenish-yellow at the base, darker at the tip; body greenish or pale greenish-yellow; antennae dusky. Another winged specimen, probably a male, varies considerably from the above description; the second fork of the third vein is very short and near the apex, and in some cases absent in one wing and present in the other. Honey tubes with the enlargement less than the preceding, and carried nearer to the apex; antennae also differ slightly in the respective length of the joints. Head and abdomen olive green; thorax and eyes black; antennae dusky, legs pale, dark at the knees and tarsi.

Pupa.—Elongate oblong in form; very pale with a dark green stripe along the middle of the back, with apparent whitish powder speckled sparsely over the body. Head whitish; base of antennae greenish-white, rest pale fuscous, dark at the tip of the joints and at the tip of the antennae; eyes brown; femora greenish-white; tibiae fuscous; tarsi darker. Honey tubes long, slender, pale at base and dusky at the tip. Tail short, conical, greenish.

The summer broods of this species are viviparous, but there must be a fall sexual brood, containing oviparous females which deposit eggs, from which hatch the early spring broods.

Its Injuries.—This species was first detected in the garden of Col. L. W. Spratt.

The Colonel drew my attention to some sickly tomato vines and showed me others that had died and asked me what was the matter with them. An examination revealed the Aphids along the stem stalk and on some of the leaves, and I feel convinced that these little creatures were the cause of the trouble. Their puncture has a blistering and blighting effect on the vine, and the leaves curl and wither.

Natural Enemies and Parasites.—I detected the larvæ of a Lace-wing (*Hemerobius*) and certain *Seymni* feeding upon them; also bred from them two internal parasites as follows:

TOMATO APHIS ALLOTRIA.—*Allotria megoura* n. sp.—FEMALE.—Length .03 inch. Black, shining. Face testaceous; antennae long, 12-jointed, subuliform, dark honey-yellow, infuscated from two-thirds its length to tip; thorax smooth, shining; scutellum oval, convex; abdomen globose, slightly testaceous in certain lights; legs dark honey-yellow; wings hyaline, ciliated, veins yellowish.

Described from one specimen bred May 26th.

THE TOMATO APHIS ENCYRTID.—*Encyrtus? megoura* n. sp.—MALE AND FEMALE.—Length from .02 to .03 inch. Blue-black. Head duely punctate; eyes large with coarse facets; mouth piceous; antennae 11-jointed, covered with short pubescence in female, in male with two whorls of hairs on each joint; the flagellum gradually widens towards tip in female, narrower in male; scutellum slightly metallic in female, brighter in male, with some long hairs; abdomen blackish or brownish, short, stout, with long hairs at sides; wings hyaline; veins yellowish; marginal vein very short; legs yellowish, coxae, femora except at tip, and a broad annulus on upper half of tibiae darker.

Described from three specimens.

Remedies.—Those recommended for "Cabbage Aphid" will be just as effectual for this species.

INSECTS AFFECTING THE EGG PLANT.

The egg plant is comparatively but little cultivated in Florida, and no serious injury is done it by insect pests.

The "Tomato Worms," *Sphinx carolina* and *Sphinx 5-maculata* are both found on it eating the leaves; also a Tortricid and a Tineid.

A Membracid (*Acutalis calva* Say) is found on the stalk, a Blister Beetle (*Epicauta cinerea* Först.) in blossoms, and occasionally eating the leaves; at times a small black jumping bug (*Halticus bractatus* Say) is very plentiful on both stalk and leaves, as well as *Stictoccephala inermis* Fabr., and on the under surface of the leaves an Aphis.

THE EGG PLANT APHIS.

(*Siphonophora cucurbitae* Middleton.)

Distribution.—This species was first detected on Squash vines at Carbondale, Illinois, May, 1878, by Miss Nettie Middleton, and described in Eighth Report Illinois Insects, page 67, and I know of no other reference to it. The specimens found here on Egg Plants agree perfectly with her description, and it is probably extensively distributed over the Eastern United States on various plants belonging to the Cucurbitaceæ.

I quote her original description:

Winged Specimens.—Large and green. Antennæ very long, reaching to or beyond the tip of the tail: third joint a little longer than the fourth: fourth about the same length or very slightly longer than fifth: sixth not more than one-fourth or one-third the length of the fifth: seventh longest: wings transparent; veins slender; the first fork makes a very acute angle with the third vein; second fork rather nearer the third vein than the apex: fourth vein curves sharply and approaches somewhat closely in its middle to the first fork: stigma elongate and narrow; honey tubes long, slender, and cylindrical, extending beyond the tip of the abdomen, but not to the tip of the tail, about one-fifth the length of the body: tail long, subconical, more than half the length of the honey tubes (in the wingless specimens). The form of the body in both the winged and wingless specimens is elongate and fusiform, the latter being slightly broader than the former. Length of body .19 inch, to tip of wing .18 inch, and some appear to even exceed this size: body green; head paler, more or less yellowish: thorax pale brownish or fawn colored or tinged with this color; abdomen green, with a darker green median line: first and second joints of the antennæ pale, third dark, seventh light, shades of light and dark more or less alternating: honey tubes green at base, changing to fuscous at the tip; tail greenish: eyes brown; stigma pale.

Wingless Specimen.—Green, with few markings: Body slightly broader than winged specimens, and elongate ovate: the abdomen tapering posteriorly to the elongated tail, which is elongate conical, its length more than half and almost equal to that of the honey tubes. The honey tubes are long, somewhat robust and cylindrical: they extend beyond the tip of the abdomen, although the posterior tapering segments are much drawn out, but not to the tip of the tail. In most of the specimens examined under a strong magnifying power they appear slightly and minutely wrinkled transversely, or what may perhaps better describe the appearance pustulate or scaly. The

length of body is usually rather greater than of the winged specimens. In both the antennae and front of the head are hairy, and many of the hairs appear to be capitate.

Its Injuries.—It is only in early spring that the plant suffers much from this Aphid, and then almost any wash would destroy it; later the rains and natural enemies almost totally destroy it.

Parasites.—Enemies that are usually found destroying plant-lice—Coccinellidae and Hemerobiidae—were also observed associated with this species; but besides these I bred from it a parasitic Cynipid as follows:

THE EGG PLANT APHIS ECCOILA, *Eucoila siphonophora* n. sp.—MALE.—Length, .05 inch: dark, piceo-black: polished: in shape somewhat linear: antennae longer than body: 15-jointed: filiform, red: third joint longest, excised: following joints long, moniliform: scutellum cupuliform: abdomen slightly compressed, with hairy girdle at base: legs red: posterior coxae rather large, somewhat pale: wings hyaline, pubescent, and ciliate.

Described from one specimen, bred May 30.

INSECTS AFFECTING THE PEA.

There are several insects destroying the Pea in Florida, but it was too late in the season when I began my work to study them in the field, the Pea crop being about over.

Crickets, grasshoppers, beetles, and caterpillars cut and eat the leaves and pods; but by far the most destructive is a root-mining Anthomyid fly, which preys upon the roots.

Its existence is entirely unsuspected by the grower, and I hope another season will enable me to thoroughly work it up.

The maggots bore into and burrow the roots near the crown, and in a short time flourishing and luxuriant vines are killed.

Our people attribute the cause to the hot weather, and would be surprised could they see the larvae at work.

INSECTS AFFECTING THE BEAN.

The same general remarks made in regard to insects of the Pea will apply to the Bean also, and I have only been able to work up the life history of one "Cut-worm," taken while in the act, in June.

THE BEAN CUT-WORM.

(*Telesilla cinereola* Guenée.)

The moth of this species has long been known to collectors, but the caterpillar, I believe, up to the present time, remains unidentified and undescribed.

Distribution.—Found generally spread over the United States east of the Rocky Mountains and in Canada and the West Indies. Professor Snow reports it common in Kansas: in Florida it is rare.

Its Life History.—*The Egg.*—Unknown.

The Larva.—This in shape and size very much resembles the Cabbage Worm (*Plusia brassicae*), and, like it, when disturbed draws itself up and has the appearance of a geometrid larva. When full grown it measures one and one-tenth of an inch in length. Pale green, with a wavy, yellow stigma line and a supra-stigma creamy white line and two pale dorsal lines, 8 transverse black warty dots on segments with two more on dorsum back of these, from all of which issue pale hairs; on either side of the dorsal black warty tubercles is an irregular yellowish line, and an indistinct yellowish oblique line extending from the outer line obliquely between the first pair of tubercles and last pair to the dorsal lines. The six true legs are pale, glassy, and there are prolegs on ninth, tenth, and anal segments. Head green, with sutural edges dark and a few hairs at sides.

The Pupa.—Length, .42 inch; greatest width, .15; wing cases, .21 inch; pale yellow brown, the fifth segment rather strongly constricted anteriorly and widest; the edges of all the segments anteriorly dark brown.

The Moth.—Wing expanse from one inch and ten-hundredths to one inch and fifteen-hundredths. The fore wings are grayish brown, with a few short, indistinct, wavy, lighter grayish lines interspersed; transversely across the fore wing near the outer margin is a light gray or slightly yellowish band.

The hind wings are uniformly gray, fringed with short cilia; beneath, silvery gray with numerous brownish gray scales at anterior margin and on fore wing.

Its Injuries.—The worm feeds on the leaves and the bean pods, sometimes stripping the vine bare.

OTHER BEAN INSECTS.

A Katydid (*Phylloptera oblongifolia* Dels.), a Butterfly larva (*Eudamus proteus* Linn.), and a Tineid are also found damaging this crop.

INSECTS AFFECTING THE SQUASH.

In Florida there are many insects found feeding on this plant: the Cucumber Flea-beetle (*Crepidodera cucumeris* Harris), the 12-spotted Diabrotica (*Diabrotica 12-punctata* Oliv.), a jumping bug (*Halticus braetatus* Say), the False Chinch (*Triphleps insidiosus* Say), a Mining Fly (*Oscinis*), and an Aphis (*Aphis cucurbitae* Buckton) are common on the leaves and stems, but have not been observed to do much injury. The life histories of and observations concerning the more injurious are given below.

THE SQUASH BUG.

(*Anasa tristis* DeGeer).

When this bug exists in quantities probably there is no more injurious insect known to squash and pumpkin vines. The mature bug hibernates in the winter under debris, old vines, dry grass, boards, &c., and from early spring to late fall there is a continual succession of broods.

I have taken some specimens in mid-winter, on warm days, in old fields and on fences.

Distribution.—It is found generally throughout the United States and

in Canada; *Anasa ahleri* Stal., found in Mexico, will probably prove to be nothing but a climatic or varietal form of this well-known insect:

ITS LIFE HISTORY.—The Egg.—Length, .04 inch; oval, flattened on three sides, so that when viewed from either end it has a triangular appearance; in color it is dark golden bronze. To the unassisted eye it is smooth and shining, but when viewed under a high-power lens the surface is reticulated.

The Larva.—When first hatched the young bug is broadly oval, with long antennae, the joints of which are flat, hairy; the head, thorax, and wing-scales blackish, while abdomen is a bright ochre yellow. Length, .08 inch.

Its Injuries and Food Plants.—It confines its attacks almost exclusively to the Squash and Pumpkin, although it is not improbable that other cucurbitaceous vines also suffer from it.

The bug punctures the leaves and the stem of the vine, causing them to wrinkle and wither; also the fruit.

The eggs are laid in patches, twenty or thirty together, on the upper or lower surface of the leaves, fastened to the leaf with a sticky or gluey substance, at night or just before dark, for during the day these disgusting bugs seek shelter in the ground or under trash at the base of the vine stalk.

It is curious to watch them come forth from their hiding places as the sun sinks and darkness begins to fall. Brood after brood march up the vine, led by an older one, like the different corps of an army march to the parade ground at roll call. They come from everywhere—in the ground, under grass, trash, and boards. Indeed, it is astonishing to see how soon vines will be crowded with these bugs, where but a few hours before not one could be found.

Natural Enemies and Parasites.—Birds and fowls, on account of their peculiar odor, will not feed on them, and beetles, wasps, and spiders, which attack caterpillars and other insects, shun it as a foul thing. Fortunately, however, there are parasites that prey on the egg, and thus greatly diminish it, although no author that I am aware of mentions this fact. It was therefore a surprise and a gratification for me when I bred three distinct parasites from the eggs the past summer—a *Empelmid*, an *Encyrtid*, and a *Telenomid*.

THE SQUASH-BUG EGG TELENOMUS.—*Telenomus anaso* n. sp.—MALE AND FEMALE.—Black, very coarsely irregularly reticulately punctate, with white pubescence; antennae in female clavate, 12-jointed, brown; in male flagellate, 14-jointed, pale brown; legs, pale brown or yellowish brown; coxae, black; abdomen in female, ovate, sub-convex above, highly convex beneath, and with a light carina at sides; in male somewhat fusiform. Wings, hyaline, with a slight fuscous tinge, pubescent, the marginal vein very short, post-marginal long, while the stigmal is about two-thirds as long as post-marginal; all yellowish.

Described from numerous specimens bred in June and July.

About thirty per cent. of the eggs collected were parasitized by this insect.

THE SQUASH-BUG EGG ENCYRTID.—*Encyrtus anaso* n. sp.—FEMALE.—Length, .05 inch; robust; head and thorax blue-black; abdomen and tip of scutellum cupreous; the very large pleura and cheeks are decidedly blue; antennae and legs pale brown; the

scape at base and tarsi yellowish. The femora have a large bluish-black blotch in the middle.

Described from two specimens.

The Reduvius Egg Eupelmid—*Eupelmus redurii* Howard.—Seven specimens of what I have identified as this species were bred from *Anasa* eggs in July.

For a description of the species see Canadian Entomologist, Vol. XII, page 207.

THE SQUASH BORER.

(*Eudiotis nitidalis* Cramer.)

The worm so commonly found with us boring into squashes, at the North goes under the name of "Pickle Worm." There it is found eating the leaves and boring into the fleshy portions of the Cucumber.

Distribution.—It is found in the West Indies, throughout the United States, and in Canada.

Food Plants.—As a borer it is found in Squash, Cucumbers, and Melons, but it will also feed on the leaves of all of these vines. The moth is very common and it must have other food plants; Guénée mentions a species of Potato as its food plant.

Its Injuries.—The worms bore cylindrical holes into the Squash, and feed on the fleshy pulp, causing it to rot and decay.

Parasites.—From one of the pupæ I bred a Chalcid fly, *Chalcis ovata*, Say, but no other parasites are known to infest it.

Remedy.—Professor Riley, Second Missouri Entomological Report, p. 70, suggests "overhauling the vines early in the summer, and destroying the first worms that appear, either by feeding the infested fruit to hogs or cattle, or by killing the worms on the spot."

THE SQUASH VINE BORER.

(*Melittia ceto* Westw.).

This well known insect, unlike *Eudiotis nitidalis*, does not bore into the Squash or fruit, but into the stem of the vine, often killing it.

I have taken two or three borers at a time from a single stem, and in confinement they proved to be cannibalistic—feeding upon one another—as was exemplified with some I attempted to rear this summer.

No borers were observed in the vine until July.

Distribution.—Found generally throughout the United States.

Food Plants.—Its attacks are almost strictly confined to the Squash, although it has been reported to bore at times into Pumpkin vines.

ITS LIFE HISTORY.—*The egg*.—The egg is oval and of a dull red.

The Larva.—Full grown larvæ measure from one inch to one inch and a fourth. Somewhat depressed, fleshy, soft, tapering at each extremity; segments ten in number, very distinct, the incisions being deep; the eleventh or last segment minute, and hardly distinct from the tenth. Head retractile, small, brown, paler on the front, and with the usual V-like mark on it. First segment or collar with two oblique brown marks on the top, converging behind. A dark line, occasioned by the dorsal vessel

seen through the transparent skin, along the top of the back, from the fourth to the tenth rings inclusive. True legs six, articulate, brown; prolegs wanting or replaced by double rows of hooks in pairs beneath the sixth, seventh, eighth, and ninth rings, and two single rows under the last ring. Spiracles brown. A few very short hairs on each ring, arising singly from little hard points or pit-like, warty substances.

The Pupa.—This is inclosed in a cocoon made of the squash stalk, tied together with a few silken threads.

The Moth.—The wings expand one inch and one quarter. Opaque lustrous, olive-brown: hind wings transparent, with the margin and fringes brown: antennæ greenish black, palpi pale yellow, with a little black tuft near the tip: thorax olive; abdomen deep orange, with a transverse basal black band, and a longitudinal row of five or six black spots: tibiae and tarsi of the hind legs thickly fringed on the inside with black, and on the outside with long orange-colored hairs; spurs covered with white hairs. (Harris.)

Its Injuries.—The female moth lays an egg on the vine near the roots: the worm which hatches therefrom bores into and feeds on the soft succulent interior of the stem, particularly at its origin near the ground, and at the base of the leaves: frequently when small the worm bores even into the larger leaf-veins. It may easily be detected at work by the withering of the leaves and stem.

Parasites.—I know of no parasites bred from this borer; although I have a large, beautiful, golden green Pteromalid, captured on the vines, that may possibly prove to be its parasite; others were seen on the vine or its vicinity.

Remedies.—The following suggestions and remedies will be found useful in destroying the pest:

Cutting out the larvæ.—This method has been long in use by gardeners, and with a little practice one soon becomes quite expert in detecting and removing the larvæ.

Bisulphide of Carbon in the Ground.—Prof. C. V. Riley first suggested the use of this insecticide in destroying grape phylloxera and Prof. A. J. Cook has since used it successfully in destroying this borer. He says: "A small hole is made in the earth near the main root of the plant by the use of a walking-stick or other rod, and about a teaspoonful of the liquid poured in, when the hole is quickly filled with earth and pressed down by the foot." In every instance the insects were killed without injury to the plant.

Gas-lime.—Fresh gas-lime, liberally distributed, after the removal of the crop, will kill the larvæ within the cocoons. It is well also to follow Professor Lintner, who says: "An infested crop should not be followed by another upon the same ground."

Treatment with Saltpeter.—"Four tablespoonfuls dissolved in a pail of water, and about a quart applied to each hill where an attack was noticed and the leaves were wilting, at the time when the vines were just beginning to run nicely, effectually arrested the attack and a fine crop followed." (*Country Gentleman.*)

INSECTS AFFECTING THE MELON.

There are two insect pests which seriously damage this crop in Florida—a borer and an Aphis—both damaging the crop annually to the extent of thousands of dollars.

THE MELON BORER.

(*Eudiotis hyalinata* Linn.)

In July the melon crop (Cantaloupes and Musk-melons) is almost totally destroyed by the injuries committed by this worm. By the end of the month hardly a melon can be found that has not been bored into by this destructive pest.

Distribution.—It is a common and extensively distributed species over North America, the West Indies, and South America. Guenée also records having received it from French Guiana.

Its total annihilation is devoutly wished for by growers and lovers of good melons, and a preventive from its attacks greatly desired.

Food Plants.—In several instances I have taken the larvæ in Squash, but it is almost exclusively confined to the Melon. From two to six worms have been taken from a single nutmeg melon. Guenée states it is found in Pumpkins, Watermelons, and other cucurbitaceous plants. Now, I have never yet found a borer in Watermelons, and the statement that this worm is found in this fruit must be taken *cum grano salis*.

The Larva.—Length eight-tenths of an inch. Color translucent green or pale greenish-yellow, with the head and cervical shield yellowish; the jaws and surroundings of mouth parts black; from both sides of head issue some fine hairs; the stigmata are yellowish; the warty tubercles on the different segments are arranged as in the larva of *Eudiotis nitidalis*, its nearest ally, only they are neither so prominent nor black, but green, and the hairs issuing therefrom are very fine and almost invisible to the naked eye; the legs are the same in both species.

The Pupa.—This is long and slender, seven-twelfths of an inch in length, yellow-brown, darker, and tapering to a point at tail; the wing cases are long and rather narrow, and the antennal case is very long, projecting beyond the base of the 8th ventral segment. All the segments are well separated, microscopically rugose and wrinkled. The pupa is generally inclosed in a loosely-woven web or cocoon made by drawing a leaf together. But this is not always the case. In two instances I found the pupa loose in the soft pulp of the melon, in the juiciest portion, and it was quite lively, twisting its abdomen from side to side and wiggling about like a thing of life.

The Moth.—Wing expanse from one inch and one-sixth to a little over. The wings are translucent, pearly white, iridescent, and with a glossy brown-black border; the abdomen is also pearly white, excepting the last two segments above, which are blackish, and ends in a tuft of hairs or expanded brush, of a buff color, tipped with white and black; the head and the thorax above are brown-black, glossy; the legs are white excepting the fore-thighs and tibiae, which are discolored above with buff-colored scales; middle tibiae armed with two spines, one longer than the other; posterior tibiae similarly armed, but with an additional pair in the middle, beneath.

Its Injuries.—The larvæ begin by eating the leaves, and the diet of the first brood of worms must consist almost exclusively of phyllophagous food. It is only as the melons begin to mature that the worms bore into them; for comparatively few green melons were found affected.

Of the large melons examined, from four to six worms were taken from each, and in every case where this happened the melon had reached its full growth and was undergoing the process of ripening.

This worm does not always bore directly into the interior of the fruit, sometimes confining itself to the outer rind or boring irregular galleries just beneath it; when it attacks the inner or fleshy portions it is most destructive, excavating long galleries filled with its soft excrements, in which the worm wallows and crawls backward and forward, and the fruit then soon sours and decays.

Parasites.—Two parasites were reported on the worm in the Agricultural Report for 1879. An Ichneumonid fly (*Pimpla conquisitor* Say), and a Tachina fly are represented in Plate III, Fig. 6, of said report. No parasites were bred from it by me, the majority of the pupæ in my breeding boxes having been destroyed by a small red ant.

Remedy.—See Squash Borer.

THE MELON PLANT-LOUSE

(*Aphis citrulli* Ashmead.)*

My first acquaintance with this plant-louse was made while on an entomological tour to extreme South Florida in April, 1880, on Metacombie Key, where it had completely devastated the melon patch of a Mr. Sands.

Mr. S., who was a native of the Bahamas, termed the disease "Curled Leaf," and was not aware it was caused by an insect, until I convinced him of that fact by showing him the insects through my pocket lens.

Distribution.—At times the species is very injurious to melon vines in Florida, Georgia, and places in the West. Prof. S. A. Forbes treats of this same insect under the name of "the Melon Plant-louse," (*Aphis cucumeris* n. sp.), in the Twelfth Report of the State Entomologist of Illinois, page 83. It was first briefly described by the writer in the Florida Dispatch, New Series, Vol. 1, page 241, July 7, 1882, more than a year previous to the description by Professor Forbes.†

Food Plants.—Its attacks are confined generally to the watermelon vines, although occasionally found on Squash and other Cucurbitaceæ. In the West its habits seem to be similar. Dr. Cyrus Thomas, in

* Synonym, *Aphis cucumeris* Forbes, Ill. Insect Rep., XII, p. 83.

† Mr. Ashmead disregards the well-known rules of zoological nomenclature in insisting upon the priority of his *A. citrulli*, as a name attached to a description published simply in the *Florida Dispatch* cannot hold. This species should be known as *A. cucumeris* Forbes.—C. V. R.

the Farmers' Review for September 2, 1880, says: "There has been great complaint among our gardeners this season in reference to a plant-louse that is doing much injury to the nutmeg and muskmelon vines, and also to the cucumber vines. In some instances they have almost entirely destroyed the entire fields of vines."

Its NATURAL HISTORY.—*Very Young.*—Length, .02 inch; greenish yellow; eyes, brown; tips of honey tubes brown; legs pale.

Wingless Female.—Length, .04 inch; yellow; eyes dark brown; honey tubes slightly conical, black; cauda distinct, dark green; legs pale; extreme tips of tibiae and tarsi black.

Winged Females.—Length, .05 inch, ovate; head and thorax shining black, sometimes with the prothoracic segment green or yellowish; the antennae are dark and do not reach the honey tubes; abdomen dark-greenish yellow, spotted along sides; honey tubes black, thickest at base, gradually tapering to tip; cauda distinct, greenish yellow or dark green; wings hyaline, with stigma and veins pale yellowish; legs pale, with tarsi and extreme tips of tibiae and femora black.

Its Injuries.—The viviparous female breeds very rapidly and is soon surrounded by young in various stages of growth. In a brief time these reach maturity, wander off to new leaves and shoots, and begin colonies of their own. When these lice become too numerous they exhaust the vitality of the vine, distort the leaves and cause them to curl up and wither. The growing terminal shoots are also crowded with them, and then the vine can make no headway; it is fruitless and dies.

It is one of the most destructive plant-lice. To illustrate its destructiveness I cannot do better than quote from an article I wrote in Florida Dispatch, July 27, 1882, after investigating its injuries in Georgia:

Some figures here in regard to the damage done by the "Watermelon Aphis" will not be amiss, and will show our planters the necessity for prompt and united efforts in its destruction.

In Georgia the estimated yield of the watermelon crop this year (1882) for shipment was 900 car-loads, or 900,000 melons. Many at the beginning of the season bring \$49 and \$50 per hundred. However, to keep within a fair valuation and rather below the true amount, we will say they bring \$25 per hundred, which equals, in round numbers, for the crop \$225,000. Now, what has been the yield? The shipments are nearly over, and they have not yet reached 600 car-loads, a falling off of 33 per cent., or a total loss of \$75,000, due mainly to the ravages of an insect!

The above statistics of loss are founded upon data of the estimate yield for but three counties, principally Thomas, Brooks, and Lowndes, in Georgia. In Florida the crop has from the same cause met with a loss still greater, and we are considerably below the estimate when we say the total loss to the planters of the two States is not less than \$150,000.

Natural Enemies and Parasites.—These have not been specially studied, but the enemies and parasites will be found to be similar to those of the "Cabbage Aphis"—flies belonging to the family Syrphidae, the Lace-wings (*Chrysopidae*), Chalcid flies (*Chalcididae*), and Lady-birds (*Coccinellidae*).

Remedies.—An important help in their destruction, and to which the planters' especial attention is requested, and which is equally applicable to other crops, is the following, which, if universally carried out, would

materially assist in the destruction of all noxious and destructive insect pests:

Never plant watermelons two successive years in the same field. Plant always in an entirely new field and as far off as possible from ground in which they were grown the previous year.

My reason for recommending this is obvious on account of the peculiarity in the development and propagation of the *Aphididæ*. The spring and summer broods in the majority of the species are viviparous, while the fall brood of females are oviparous. The last, therefore, lay the eggs, which lie dormant in the ground all winter and hatch with the first warm breath of spring; now, then, if this field is plowed up and other crops planted, the young aphids have nothing to feed on and so perish.

My observation on this species, too, has been, that it is only troublesome in fields planted in melons two or three years in succession: new melon fields are not affected by it, or to such a small extent as to be unnoticeable.

Spraying with a dilute emulsion of kerosene will doubtless prove an effectual remedy as with other plant lice. The emulsion should be sprayed from the ground up so as to reach the under sides of the leaves, Professor Riley has figured and described devices for this method of spraying in his report as entomologist to the Department for 1883, pp. 136-138, and Plates IV and V.

REPORT ON BUFFALO-GNATS.

By F. M. WEBSTER, *Special Agent*.

LETTER OF TRANSMITTAL.

LAFAYETTE, IND., April 30, 1886.

SIR: I herewith transmit a report of my investigations of the habits of the Southern Buffalo-gnat.

In accordance with your instructions I left my home in La Fayette, Indiana, on February 18, reaching Vicksburg, Mississippi, on the 29th. Learning here that these gnats appeared every season in greater or less numbers in the vicinity of Somerset Landing, Tensas Parish, Louisiana, in company with Mr. T. C. Bedford, of Vicksburg, one of the leasers of Somerset Plantation, I left for that locality on the 22d, reaching our destination on the same day.

On the 23d, the weather being very pleasant, the day was spent in riding about among the teams at work on the plantation, in the hopes of observing some of the earliest appearing gnats.

During the afternoon swarms of a species of *Anthomyia* were observed in the air, and I was informed that these were the insects that killed cattle and mules. The following day was both cold and rainy, and, in fact, during the two weeks following there were but two days of sunshine.

During this inclement weather the lakes and bayous about Somerset were carefully examined, no trace of the true gnat being found. In the meantime larvæ of *Anthomyia* were found in considerable abundance about decayed logs and among decayed leaves in the woods, and, as the planters to whom I applied for information al-