BULLETIN No. 139

BOLL WEEVIL IN MISSISSIPPI, 1909.

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FIG. 1. Boll Weevil; enlarged above; natural size below. (Photo by Herrick).

AGRICULTURAL COLLEGE, MISSISSIPPI

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INTRODUCTION.

The main purpose of this bulletin is to give as near as possible the status of the boll weevil in this state at the close of the season 1909. In every county in this state there are people who think that the boll weevil is on their farms. In many cases there is not a boll weevil in a hundred miles of them. There is the greatest confusion as to how the boll weevil appears and as to its origin. The writer has met cotton planters who insist that the boll weevil has been on their farms for many years and others who claim to have obtained this insect in cotton seed from Georgia and still others who will not believe there is such a thing as a boll weevil. It is mainly to correct such false ideas that this bulletin is written. A great body of intelligent farmers in this state have kept informed in regard to the spread of this pest as well as to the best known methods of controlling it. They have obtained their information from the newspapers, bulletins of the U. S. Department of Agriculture, State Department of Agriculture, Experiment Stations, special agents of the U. S. Department of Agriculture and from the farmers' institute workers. All of these and many other agencies should be given credit for the campaign of education that has been waged in this state during the past few years.

In order to answer many questions that are constantly being asked, this bulletin deals somewhat with the life history and habits of the boll weevil and with some of the insects with which it has often been confused in this state. It will also give the best methods now known of controlling this pest.

Acknowledgments.—The writer finds it impossible to give proper credit for much of the information concerning the life history, habits, and methods of control of the boll weevil. The Bureau of Entomology of the United States Department of Agriculture, the Louisiana State Crop Pest Commission, and the State Entomologists of Texas are the sources of most of the original information regarding this insect. The writer has read carefully every available publication upon this subject and is under special obligations to the writings of Mr. W. D. Hunter, Dr. L. O. Howard, Mr. Wilmot Newell and his assistants, Mr. E. D. Sanderson, Mr. W. D. Pierce, Dr. W. E. Hinds and Mr. C. H. T. Townsend. We are indebted to Dr. L. O. Howard,
Chief of the Bureau of Entomology, for the illustrations taken from the publications of that Bureau. The illustration on the cover is from photographs by Professor Glenn W. Herrick, formerly Entomologist of this Station. Mr. W. D. Hunter, who is in charge of the boll weevil investigations of the Bureau of Entomology, and his assistant, Mr. W. D. Pierce, kindly furnished much information regarding the spread of the boll weevil in Mississippi. It has been the endeavor of the writer to give proper credit for the finding of the boll weevil in each county. If any errors or mis-statements of any kind are found, the writer will consider it a favor if his attention is called to them.

**LIFE HISTORY AND HABITS.**

The boll weevil is an insect with four stages in its life history—egg, larva or grub, pupa or quiescent, and adult stage.

**Egg stage.**—The eggs are usually laid within the squares of the cotton plant. When the squares are scarce, the weevils will lay their eggs within the bolls preferring the small tender ones, but if these are scarce they may attack larger bolls. The mouthparts of the adults are located at the end of the snout; by means of their tiny jaws they eat small holes into the squares and then deposit one egg in each puncture. Usually only one egg is deposited in each square. In a large boll where there is enough food for more than one larva, several eggs are sometimes deposited. The eggs are so small and inconspicuous that they are difficult to find. They hatch usually in about 3 or 4 days. This varies with the temperature. The length of time required for hatching has been known to vary from 2 to 15 days.

**Larva or grub stage** (Figures 2 and 3).—The egg hatches into a tiny white footless grub with a brown head and still darker jaws. This grub

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*FIG. 2. Larva full grown, ovary in square entirely destroyed. (Hunter and Hinds, Bul. 51, Bureau of Ent., U. S. Dept. of Agr.).*
begins at once to feed upon the tissues within the square or boll and grows rather rapidly. Generally from 6 to 12 days is required for the larvae to become full grown. However, this depends very much upon the temperature. In the warmest weather of summer the larvae will make their full growth in 6 days, but in the cooler weather of spring and fall a longer time is required. Under certain conditions they may remain from 20 to 30 days in the larva stage. It is said that the larvae in large bolls require a much longer time to develop than those that develop in small bolls or squares. The larvae always remain out of sight. It is in this stage that the greatest damage is done. They devour the entire inside of the forms and squares and make cells in the larger bolls. When full grown they pupate within these cells.

**Pupa or quiescent stage.**—This is the stage that is similar to the cocoon stage of moths. It is the intermediate stage between the larva and the adult. From 3 to 5 days is usually required for pupation. However, in cool weather a longer period may be necessary. From the pupa emerges the adult weevil.

**The adult stage** (Figures 1 and 11).—The adult develops from the pupa within the square or boll and soon begins to eat its way out. This is done by eating a hole large enough to allow it to escape. The squares with the holes from which the adults have emerged (Figure 4) somewhat resemble those damaged by the boll-worm, and are sometimes the cause of confusion by people not acquainted with the work of both insects. When the adults first emerge they are almost pink in color but rapidly turn darker until they have a chocolate color. The adults usually are from one-fourth to three-eighths of an inch long and about half as broad. The body is thinly covered with fine light colored hairs. These rub off rather readily and the old adults may usually be recognized by the loss of most of these hairs and a conse-
quent darker brown color. In fact the adults that pass through the winter usually have a darker appearance than those that are found during the summer. The snout has a shiny black color and is slightly curved. The jaws are located at the end of this snout. The antennae or "feelers" are near the end as is shown in the illustrations. The snout is about half as long as the body.

**How to distinguish the adults.**—The safest plan for all who are not well acquainted with this insect is to send any doubtful specimens to the Entomologist, Agricultural College, Miss. However, there are a few characteristics that will assist in separating this species from the hundreds of other weevils that resemble it somewhat. It has a characteristic shape, a fairly characteristic size and usually a dark brown or chocolate color. On each front leg are two spines—one somewhat larger than the other. The wing-covers have a ridged or lined appearance. These lines are parallel. On the prothorax just back of the eyes and snout is usually a light colored line running to the wing covers. This line is caused by the fine hairs being somewhat more numerous at this part of the body. In old specimens this light colored line is not as apparent as in fresh specimens.

**Males and females.**—The two sexes are produced in about equal numbers but they resemble each other so much in appearance that it is out of the question for the average person to distinguish them.
Food plants (Figures 5, 6 and 7).—The boll weevil has never been known to feed naturally upon any other plant but cotton. The reports of boll weevils feeding upon peas and various other plants are undoubtedly due to the fact that some of the other insects resembling the boll weevil have been mistaken for it. When captured and placed in confinement the boll weevil may be starved until it will feed upon other plants to a slight extent.

Rate of increase.—Between two and three weeks is generally required for a boll weevil to develop from an egg to an adult. This varies with the temperature as shown in the discussion of the different stages. The warmer the weather the more rapidly do they develop. They begin laying eggs usually as soon as the first squares appear on the plants and continue to increase until checked by frost. The average number of eggs laid by each female is said to be 139. “A conservative estimate of the possible progeny of a single pair of weevils during a season beginning on June 20th, and extending to November 4th, is 12,755,100.” This is a quotation from Mr. Hunter, and, that he has only counted on four generations in a season, and on each female laying only 100 eggs shows how conservative the estimate is.

Age of weevils.—I have often been asked how long a boll weevil will live? The age varies greatly. Those that are born during the summer probably do not live over sixty days. They live long enough to lay their eggs, and then they are ready to die. However, the weevils that mature late in the fall are the ones that pass through the winter. They must live for at least six months and probably many of them live for eight or nine months. Mr. Hunter says: “The longest-lived weevil on record lived from December 10 to the following October, a period of about eleven months. Undoubtedly such prolonged life is exceptional.”

Does the boll weevil work at night?—Careful observers have found that the boll weevil is not active after sundown.
Is the boll weevil attracted to lights?—I have been asked this question many times by people who have found closely related insects at lights. Although many other weevils are sometimes attracted to lights at night, the writer has never heard of a single instance where a boll weevil has been found among them.

**Mexican and Texas boll weevils.**—There is considerable confusion in the minds of many people in regard to these names. Some think that there are two kinds of boll weevils, one from Mexico and the other from Texas. There is but one species of boll weevil. It is probably native of Mexico but Texas was the first state in this country that was infested.

Why does the boll weevil "sull"?—When a boll weevil is disturbed it will often "play 'possum" or "sull", that is, it will feign death and curl up its legs and fall prostrate. This habit is not true of all boll weevils but is true of a great many. The habit of feigning death is a means used by many insects to protect themselves from enemies. By falling to the ground the boll weevil is out of sight and not likely to be found by the enemy that was disturbing it.

**Effect of frost.**—The boll weevils are active until frost checks them in the fall. The immature stages are probably always killed during the winter, but the adults live through the winter, or "hibernate." The adults are not killed but become dormant and remain in this condition until warm weather when they again become active, continue feeding and laying eggs. An early severe frost is much to be desired as this makes it impossible for weevils to mature late in the fall. The hibernating adults must live for a longer period before having an opportunity to lay eggs and their chances of not living are proportionately greater.

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**FIG. 6.** Bloom distorted by many feeding punctures made when about to open. (Hunter and Hinds, Bul. 51, Bureau of Ent., U.S. Dept. of Agr.)
Hibernation.—This is the condition described in the previous paragraph. It is the winter condition of an insect. In the case of the boll weevil it is always passed in the adult stage. When cool weather arrives the weevils begin to look for hibernating quarters. Any place that will afford some protection will do. Most of the weevils leave the cotton fields and hibernate under grass and weeds, in Spanish moss, under rubbish, or in any place where protection is given. Many weevils remain in the cotton fields, in cracks and crevices in the ground, or in the empty cotton burrs. As a matter of fact the majority of the boll weevils die during the winter. Only a small percentage of them hibernate successfully. There are therefore but a comparatively few weevils left to infest the fields in the spring.

Effect of the winter of 1909-1910 in Mississippi.—It will be impossible to state just what effect the past winter has had upon the boll weevils until next summer when they have emerged from hibernation. As a general thing during a severe winter a larger percentage of weevils will be killed than during a mild winter. During the past season there has been more cold weather, more sudden changes from warm to cold, and more snow and sleet than during the other two winters that the boll weevils have been in this state. It is to be hoped that there will be but few weevils to begin work this spring, and it is even possible that the past winter will give the weevils a set back, but that is very doubtful. If there had been a very early frost there would be more prospect of this. At any rate it will be interesting to observe just what effect a winter like the past one will have upon the boll weevil in this state.

Relation of birds to the boll weevil.—Thirty-eight species of birds are known to eat boll weevils. The swallows, night-hawks and orioles are the most important. The night-hawk or bull-bat devours large numbers of the weevils. The orioles show a preference for the boll

![FIG. 7. Weevils feeding extensively on medium sized boll. (Hunter and Hinds, Bul. 51, Bureau of Ent., U. S. Dept. of Agr.)]
weevil. "There are six species of swallows in the Southern states, and these seem to be the most important in destroying the weevil. The martin is one we can easily protect and induce to multiply because it is domestic and makes its nests in boxes, gourds, etc., placed on poles or roofs of buildings." The meadow larks and mocking-birds also feed upon the boll weevil, and even the bob-white or "quail" will eat them. Many other birds will undoubtedly adapt themselves to the boll weevil and devour them in increasing numbers each year.

In the fight that we are waging against this insect, it is pleasing to know that we have some useful allies among the birds. All insectivorous birds should be protected; every farmer should take an active part in their protection.

**Will the boll weevil disappear?**—There is an erroneous idea prevalent in many sections that the boll weevil has been here before and will again disappear. The boll weevil was never here before, and there is no reason for believing that it will ever disappear. The boll weevil is here to stay. It will probably spread gradually over the entire cotton belt. In time its damage will probably gradually grow less and less for two reasons: First, nature will become adapted to the new insect. Our native birds and other predaceous animals, parasitic and predaceous insects will all gradually adapt themselves to the boll weevils and destroy them in increasing numbers each year. Second, the cotton growers will become educated to the weevils, and will learn how to raise cotton in spite of this pest.

**HISTORY.**

**In Mexico and Cuba.**—The boll weevil is probably a native of Southern Mexico or Central America. Cotton grows naturally in this region; and it is more than likely that the boll weevil had been a pest to the wild cotton of this area centuries before the first white man reached the New World. After Mexico was settled by white people, cotton became an article of commerce and was planted more or less throughout the country. Therefore conditions became favorable for the spread of the boll weevil from its native home. It did not have to make any very sudden changes but probably spread gradually farther and farther each year until it reached the United States in 1892. Nothing very definite is known about the spread of the weevil in Mexico, except that it was described in 1843, by an entomologist named Boheman, from specimens received from Vera Cruz. In 1873 the boll weevil was found in Cuba. It was probably accidentally introduced from Mexico. In 1885, the first account of the boll weevi
damaging cotton was recorded. Some weevils were bred in Washington, D. C., from cotton bolls sent from northern Mexico.

In the United States.—Just when the boll weevils reached this country is not known; but 1892 is generally accepted as the year that they crossed the Rio Grande into Texas, in the vicinity of Brownsville. In 1894 they were found in half a dozen counties in southeastern Texas. This was the first year that their damage was severe enough to attract considerable attention. During the next ten years the weevils spread steadily into new territory, but did not get outside of Texas. Because of the small amount of rainfall in western Texas the spread of the boll weevil in that direction has been slow. It is not likely that the boll weevil will ever become a serious pest in that region, as it does not thrive in arid climates. On the other hand, it is probable that the damage of this insect will always be greater in the more humid regions of the cotton belt that lie east of Texas.

Louisiana became infested in 1904, when the weevils spread over a large portion of the western part of that state. During the previous year, and perhaps even before that, there were some isolated infestations in western Louisiana; but the general line of infestation did not really reach that state until early in the season of 1904. Louisiana is at the present time the only state entirely within the infested area. The whole state was practically infested in 1908, and during the past season there is little doubt but that the boll weevils reached every part of the state. During the season of 1907 the weevils crossed the state at its narrowest point and, crossing the Mississippi river, spread into three counties of southwestern Mississippi.
FIG. 8. Map of Mississippi showing the spread of the boll weevil in 1907, 1908 and 1909. (Original.)
THE BOLL WEEVIL IN MISSISSIPPI.

1907.

The first boll weevils actually found in this state were taken on September 20, 1907, by Mr. W. D. Hunter in a cotton field about six miles south of Natchez, Miss. The writer spent the first week of October, 1907, in Adams and Wilkinson counties, and found that the weevils had crossed the river all the way from Natchez southward to the Louisiana line. Plenty of weevils were found in cotton fields along the river bank, and for a distance of from two to three miles east of the river. During October and November, 1907, the boll weevils spread half way across the counties of Adams and Wilkinson, and were undoubtedly in the western part of Jefferson county.

1908.

During the season of 1908, the boll weevil spread entirely over Adams, Wilkinson, Jefferson, Amite, Franklin, and Claiborne counties. The western part of Pike county was slightly infested, as was the western half of both Lincoln and Copiah counties. The southwestern parts of Hinds, Warren, and Issaquena counties were infested before the end of the season. The damage done by the boll weevil in the greater part of this area was very slight. Only in the extreme southwestern portion of the state was the damage serious. From all reports this was due largely to the fact that the planters had made very little preparation for meeting this pest. They continued to use the same methods of farming that they had followed for years, and as a consequence the boll weevil destroyed a considerable portion of their cotton.

During October, 1908, two isolated infestations were found considerably ahead of the boll weevil line: one in the eastern part of Yazoo county, and the other in the eastern part of Hinds county. It is not known how the weevils reached these places. Possibly they migrated of their own accord; but more probably they were carried to these places from boll weevil infested territory. Both of these infestations were apparently killed out during the winter, as careful searching during the entire season of 1909 failed to reveal any weevils in either of these locations.

1909.

During 1909, the boll weevil spread over a much larger portion of the state than during the previous year. Pike, Lincoln, Copiah, Hinds, Warren, and Issaquena counties were partially infested in
1908, but they are now entirely within the infested area. Lawrence, Jefferson Davis, Marion, Lamar, Pearl River, Hancock, and Harrison are now entirely within the infested area. A large portion of Washington, Sharkey, Yazoo, Rankin, Simpson, Covington, Forest, Perry, and Jackson counties are now infested. A small area of the southwestern parts of Bolivar, Madison, Jones, and Greene counties, also, are infested. It is probable that a small portion of southwestern Smith County is infested, but no weevils have actually been taken from this county. It is barely possible that the extreme southwestern portion of Sunflower county has been reached by the boll weevils. There is no reason for believing that any other county is at all infested. It is of course possible that there may be a few isolated infestations ahead of the boll weevil line. These have been rare in the past, and many "boll weevil scares" were investigated during 1909 and in every case it was found that other insects had been mistaken for boll weevils.

Two things are at once noticeable in regard to the spread of the boll weevil in this state during the past season. From the northern portion of the infested territory, the spread eastward has not been as great as was expected; and in the southern part of the state, the insect has gone farther than in any one year since its advent into Texas in 1892. It is not difficult to explain why the boll weevil has spread in the way it has. It is now a well known fact that drouth tends to check the increase of weevils, and that moisture aids their increase. The reason for this is discussed elsewhere in this bulletin. The boll weevils spread largely in search of food. If there is an abundant supply of food, their spread is naturally slow; but if the cotton fields are scattered, they spread much more rapidly. During July and August, there was a period of continued drouth and extreme heat in the northern portion of the infested area. These unfavorable weather conditions, although damaging the cotton crop, greatly decreased the number of boll weevils—so much, in fact, as to have undoubtedly checked their spread. Just east of this infested area there is an abundance of cotton raised. The migrating weevils did not have to travel far for food, and therefore did not go very far to the east. These two factors give us the reasons why the spread of the boll weevil has not been greater in Washington, Yazoo, Madison, and Rankin counties.

Exactly opposite conditions prevailed in the southern portion of the state. Along the coast there was plenty of rainfall; and in the southern and especially southeastern counties of the state, the cotton
fields are very scattered—in many cases miles apart. The greater supply of moisture meant that the weevils were not diminished in numbers as they were in the infested counties farther north. There were therefore more weevils to spread eastward and these found less cotton and accordingly had to go long distances in search of food. These facts explain the surprising spread of the boll weevil from the western part of Pike county to the eastern part of Greene and Jackson counties, or approximately to the Alabama line—about a hundred and twenty miles.

The cotton season of 1909 was a very peculiar one in this state. For the greater part of the state there is little doubt but that less cotton was produced than for many years. In some sections, however, conditions were very good, and certain counties produced large crops. The southeastern and south central portions of the state fared well. Until the final statistics are gathered it will be impossible to know just how this season compares with other years. This year's crop would have been very light if the boll weevil had never reached Mississippi. In fact, there were several other factors that played a far greater part in lessening the cotton crop than the boll weevil did.

First, the weather conditions were very unfavorable over the greater part of the state. During April, May and June there was so much rain that cotton was not planted early; a large part of that which was planted was never cultivated; and even much of that which was cultivated had been so nearly drowned out that it was badly stunted. The long, very wet spring was probably the main cause of the poor crop of 1909.

During July and August, there was a long hot and exceedingly dry period that played havoc with the small bolls. From all over the state came complaints regarding the "sheding of the bolls." Many people could see no reason for this falling of the bolls, and at once blamed any insect that they might find upon the plants. As a result many innocent and even beneficial insects were sent to us for identification; the people sending them were sure that these insects had caused the small bolls to shed. Other people concluded that the boll weevil must have reached them, especially if they happened to find an insect that in some way resembled this pest. In this manner many false reports went out as to the appearance of the boll weevil. This shedding or falling of the small bolls in midsummer was caused by physiological trouble due to the excessive heat and drouth; and was
not caused by insects of any kind. This was probably the second factor in reducing the size of the cotton crop in this state.

Taking the state as a whole, the third factor in lessening the production of cotton, in the opinion of the writer, was cotton anthracnose, or the pink boll rot of cotton (figure 9). The wet spring was probably favorable to the increase of this fungous disease. At any rate, the disease appeared to be very prevalent in all parts of the state. The writer visited cotton fields in at least one half of the counties and in all sections of the state, and found this disease in almost every field. In some cases it was doing very little damage; but in others it had destroyed from 25 per cent to 50 per cent of the cotton bolls. In one field the writer counted the bolls on a number of plants, and found from 75 per cent to 90 per cent of the bolls diseased. This was of course an exceptional case, but it simply shows the possibilities of this disease. Certain varieties of cotton seem much more likely to have anthracnose than others. Hence, great care should be used to select the varieties that are least susceptible to this disease, and to obtain seed if possible from regions where this disease is not abundant. At the present time anthracnose causes a greater loss in this state than the boll weevil.

The fourth cause of the poor crop in this state was the cotton boll-worm. This pest has always been with us. Some years it does
much more damage than others. Complaints of this insect came from all sections of the state. There is little doubt but that it did more damage during the past year than in any recent year.

Probably the boll weevil deserves the fifth place, but even that is doubtful, as this pest was serious in only about twelve counties. In the counties where the boll weevils were numerous they undoubtedly did more damage than any other insect or plant disease attacking cotton; and as the weevils spread throughout the entire state this will probably continue to be the case.

Besides the five causes already mentioned for the poor cotton crop in Mississippi this year, there might also be mentioned a number of other insect pests and plant diseases that caused more or less damage. The total loss caused by these pests amounted to a much larger sum than the average person would imagine.

**BOLL WEEVIL INFESTED COUNTIES.**

**Adams County.**—Although Wilkinson county was probably the first county in this state infested by the boll weevil, the first weevils actually found were taken about six miles south of Natchez in Adams county by Mr. W. D. Hunter, of the Bureau of Entomology, on September 20, 1907. On September 22, Mr. C. R. Jones, one of Mr. Hunter's assistants, obtained more weevils around Natchez. The writer spent the first week of October working along the Mississippi river in Adams and Wilkinson counties, and found the weevils were more numerous toward the south. It was quite evident that Wilkinson county had been infested longer than Adams county. The weevils were much more numerous at Kienstra and Arnot in the southern part of the county than they were around Natchez. At that time the line of infestation probably did not extend more than five miles east of the river but by the time the weevils were checked by frost they had gone half way across the county. The boll weevil reached Adams county too late to do any very serious damage in 1907. An average crop was made in this county in 1907. During 1908 the weevils spread throughout the entire county. As a general thing the planters gave this pest very little attention and in consequence the weevils did considerable damage—especially in the western part of the county. The cotton production fell off about one-third but this was to some extent due to the reduced acreage.

**Amite County.**—The boll weevil reached the western part of this county probably about August 1, 1908. The first weevils actually found were taken about nine miles east of Centerville by Mr. C. W.
Flynn of the U. S. Bureau of Entomology, on August 18, 1908. By the end of the season of 1908, the pest had covered the entire county. However, the weevils reached this county too late to materially damage the crop, as Amite county produced more cotton in 1908 than in either of the three preceding years.

Bolivar County.—The boll weevil reached the southwestern corner of this county late in 1909. They were found at Rex and Lamont on November 5, 1909, by Mr. E. S. Tucker, of the United States Bureau of Entomology. This of course was too late for them to do any damage. It is probable that the weevils will spread throughout the entire county during 1910, although if the planters can mature their cotton early, the boll weevil damage may not be at all serious next year.

Claiborne County.—This county was probably first reached by the boll weevils during August, 1908. The first record of weevils taken in this county was made by Mr. W. D. Pierce and Mr. H. S. Smith, at Port Gibson, Mississippi, on September 17, 1908. However, before frost had checked their spread the weevils had covered the entire county. They reached this county too late to do any very serious damage as the cotton production for this year was about up to the average. During November, 1908, the writer visited the eastern part of this county and at that time the infestation was light, but there were enough weevils to make a good start in 1909. Due largely to the efforts of Mr. G. H. Alford, County Commissioner of Agriculture, during 1909 this county made a very strong and concerted fight against the boll weevil—probably the best fight that has ever been waged in an entire county.

Copiah County.—The first boll weevils actually taken in this county were found at Crystal Springs by Mr. W. D. Pierce, of the United States Bureau of Entomology, on October 28, 1908. It is probable that the weevils reached this county early in September, 1908. However, their damage was very slight as the county produced more cotton than during the previous year. At least two-thirds of Copiah county was within the infested territory before the end of 1908. By the middle of September, 1909, the entire county was infested.

Covington County.—The first boll weevils probably reached this county late in September, 1909, but too late to do any serious damage this year. By the time they were checked by frost the weevils had probably crossed the Gulf & Ship Island Railroad tracks, and more
than one half of the county was infested. The first weevils actually found in this county were taken three miles east of Mt. Olive by Mr. W. D. Pierce, of the Bureau of Entomology, on October 13, 1909. On November 5, 1909, the writer found weevils at Seminary, Mississippi. During 1910 the entire county will undoubtedly be infested, but by forcing the cotton to early maturity the boll weevils may not be serious pests next year.

**Forest County.**—The first boll weevils probably reached this county early in October, 1909. On October 14, 1909, Mr. W. D. Pierce found them near the county line at Clyde in Lamar county and two days later he found them three miles west of Brooklyn and two miles west of Maxie. On November 1, 1909, the writer found weevils at Rawles Springs and Mammoth Springs in the northwest corner of the county and the next day found that they had spread entirely across the southern half of the county. Although careful search was made in the vicinity of Hattiesburg no boll weevils were found, and it is probable that the northeastern portion of this county was not infested during 1909; the entire county, however, will probably become infested during 1910. The boll weevils reached Forest county too late to cause noticeable injury in 1909.

**Franklin County.**—This county probably received its first weevils early in August, 1908, but by the end of September, 1908, the entire county was within the infested area. However, the effect of the pest was hardly noticeable the first year as more bales of cotton were produced in 1908 than in any of the three preceding years. The first weevils actually taken in this county were obtained by Mr. C. W. Flynn, of the United States Bureau of Entomology, at Roxie, on September 5, 1908.

**Greene County.**—This county on the eastern border of the state probably received its first boll weevils during October, 1909. The writer found weevils in all stages about three miles south of Merrill and also in the vicinity of Denny, on November 3, 1909. There is very little cotton growing in this region and this fact probably accounts for the spread of the insect across this county and the counties immediately west. It is not known how far north the infestation occurs in this county, but probably not north of the Mobile, Jackson & Kansas City Railroad.

**Hancock County.**—There is very little cotton growing in this county; and, so far as the writer is aware, no boll weevils have been taken in
the county. They were, however, very abundant at the Branch Experiment Station at McNeill, in Pearl River county.

**Harrison County.**—The first boll weevils actually found in this county were taken by Mr. C. E. Hood, of the United States Bureau of Entomology, around Wiggins, and nine miles east of Wiggins on November 8, 1909. Some days before this the writer had found boll weevils in all stages east of this in Jackson county, so there is little doubt that the weevils had reached Harrison county by October 1, 1909. The small amount of cotton grown in this county caused them to go eastward very rapidly in the search for food.

**Hinds County.**—The first boll weevils reaching this county probably arrived late in August, 1908. Our first accurate record is from Edwards where Mr. C. W. Flynn, of the Bureau of Entomology, found weevils on September 8, 1908. Correspondents sent boll weevils to the writer during October and November, 1908, from around Utica. By the time frost had checked their spread a considerable portion of southwestern Hinds county had been infested. The weevils reached this county too late to do serious damage in 1908 and were not numerous enough to be very serious in 1909. The poor crops in some sections of the county were due more to adverse weather conditions than to any insect injury. The line of infestation for 1908 extended from near Edwards in a southeasterly direction to Oakley, and then on to a point west of Terry.

One of the two isolated infestations found in 1908 considerably ahead of the line of general infestation occurred in this county just on the outskirts of Jackson. The weevils had probably been brought there accidentally from boll weevil infested territory. They were first found, I believe, by Commissioner of Agriculture, H. E. Blakeslee, and later by Mr. B. L. Moss, Special Agent of the Bureau of Plant Industry. On October 28 and 31, 1908, Mr. R. A. Cushman and Mr. W. D. Pierce, of the Bureau of Entomology, found weevils in this field. It was thought that the weevils had been there for some weeks, and it was feared that they would spread from this field during 1909. However, no more weevils were found around Jackson until September, 1909, although all of the nearby cotton fields were carefully searched during July and August of this year. There is little doubt that this infestation was completely killed out during the winter.

On September 26, 1909, Mr. B. L. Moss found boll weevils at Jackson. The entire county was probably infested before frost checked their movement.
Issaquena County.—The first weevils recorded from this county were sent to the writer by a correspondent from Fitler on June 14, 1909. The fact that adult weevils were found so early in the season proves that the weevils had reached this county sometime during the fall of 1908. The entire county was infested before September 1, 1909.

Jackson County.—This county marks the eastern extremity of the spread of the boll weevil for 1909. It is possible that some of the insects reached Alabama late in November, but none have been recorded. On November 3, 1909, the writer found many weevils in cotton fields between Crossroads and Denny in the northern part of the county and they were apparently more numerous towards the south. They had reached this county too late to do serious injury but practically the whole county is now undoubtedly infested.

Jefferson County.—This was the third county infested. Although no weevils were received during 1907 it is probable that they reached the western part of the county late in the year. During 1908 the entire county was infested but the damage caused by the boll weevil was slight as the county produced almost an average cotton crop. The first weevils recorded from this county were taken by Mr. C. W. Flynn of the Bureau of Entomology, on August 19, 1908, at Harriston.

Jefferson Davis County.—The boll weevil probably first reached this county about September 1, 1909, but by the end of the month the entire county was within the infested area. The first weevils recorded were taken by the writer at Bassfield on November 18, 1909, but a month previous to this they had been found in counties east of here. The pest reached this county too late to do serious damage during the season of 1909.

Jones County.—During October, 1909, the boll weevil line reached the extreme southwestern corner of this county. On November 1, 1909, the writer found one boll weevil in a cotton field near the Gulf & Ship Island Railroad, southeast of Lux. They did no damage in Jones county during 1909 but the entire county will probably be infested during 1910.

Lamar County.—The entire county probably became infested during September and October, 1909. On October 14 and 15, 1909, Mr. W. D. Pierce found weevils at two points in the eastern part of the county. They reached here too late to do serious damage in 1909. The small amount of cotton grown in this county accounts for the rapid movement of the insects across the county.
Lawrence County.—The first weevils reached this county in August, 1909, but by the end of September the entire county was within the infested area. The first boll weevils received from this county were sent to the writer from a correspondent in Monticello, on September 8, 1909.

Lincoln County.—The first weevils recorded from this county were taken by Mr. C. W. Flynn two miles east of Lucien on September 12, 1908. Before frost the weevils had spread over more than half of the county and Mr. W. D. Pierce found them at Brookhaven on October 28, 1908. They were too late to do any serious damage in Lincoln county in 1908 as the cotton production was considerably greater this year than in any of the three preceding years. During August, 1909, the weevils had covered the entire county.

Madison County.—The first boll weevils recorded from this county were taken by the writer at Adelle on October 18, 1909. Before frost had checked their movement they had probably reached as far east as the Y. & M. V. R. R. They reached this county too late to do any damage during 1909.

Marion County.—The boll weevils probably spread entirely over this county during September, 1909, although not in large enough numbers to do serious damage. There is not much cotton grown here which accounts largely for their rapid movement in this section. The first weevils recorded from this county were taken by Mr. W. D. Pierce near Columbia on September 16, 1909.

Pearl River County.—The boll weevils first reached here in September, 1909, but because of the small amount of cotton grown here they crossed the county within a month. The first record of weevils from this county was made by Mr. W. D. Pierce and Prof. E. B. Ferris at McNeill on October 15, 1909.

Perry County.—The first boll weevils to reach this county probably arrived in October, 1909. On November 2, 1909, the writer found weevils in all stages in the southern part of this county along the road between Brooklyn and Janice. It is not probable that the line of infestation extends north of the M. J. & K. C. R. R. The weevils reached here too late to do any damage in 1909. They will spread throughout the entire county next year.

Pike County.—At the close of the season of 1908 the eastern line of the boll weevil infested territory included a portion of the western part of this county. They reached this county too late to do any
damage as the cotton production of 1908 exceeded that of any of the three previous years. The first weevils from this county were sent in by a correspondent from Summit in November, 1908. Probably by September 1, 1909, the entire county was infested.

Rankin County.—The southwestern corner of this county became partially infested by weevils during October, 1909. Mr. W. D. Pierce found weevils near Cato on October 12, 1909. The entire county will probably become infested next year.

Sharkey County.—The southwestern corner of this county was probably infested by the boll weevil late in 1908. The first boll weevils received from this county were sent in by a correspondent from Rolling Fork on August 11, 1909. Probably the whole county became infested during 1909 although there may still be a small portion in the northeast corner that is not yet infested.

Simpson County.—The first boll weevils reached this county in September, 1909, but too late to do any serious damage this year. Mr. W. D. Pierce found weevils between Braxton and Mendenhall on October 12, 1909. The boll weevils may not have yet reached a portion of the northeastern part of this county but the entire county will be infested next year.

Warren County.—The boll weevils probably first reached this county during August, 1908. The first weevils taken in this county were found by Mr. C. W. Flynn about five miles south of Vicksburg on September 7, 1908. The entire county may have been infested last year. If a portion remained uninfested last year it was reached by weevils before September 1, 1909.

Washington County.—This county was just on the border of the infested area in 1908. It is possible that a few weevils reached here but probably did not survive the winter. The county was considered as infested in 1908 because of the isolated infestations so much farther east in Yazoo and Hinds counties. The first weevils actually recorded from this county were taken by Mr. E. S. Tucker, on October 5, 1909, at Glen Allen. He also found weevils at Greenville on November 4, 1909, and at Hollandale on November 11, 1909. Before the end of the season 1910 the entire county will probably be infested but the insects will not be numerous enough early in the year to do much damage if the cotton can be planted and matured early in 1910.

Wilkinson County.—This was probably the first county in the state to be infested by boll weevils although they were recorded first
from Adams county. The first weevils found in this county were taken by the writer during the first week of October, 1907. They were found along the Mississippi river and within four or five miles of the river from Artonish to Tarbert. Before the end of the season the weevils had spread half way across the county, but their damage amounted to little as the cotton production for the year exceeded that of either of the two preceding years. During 1908 the entire county became infested and the boll weevil undoubtedly did considerable damage, but in spite of the weevil a larger cotton crop was produced than in 1905.

**Yazoo County.**—One of the two isolated infestations that were found in 1908 considerably ahead of the line of general infestation was found in this county. Mr. H. E. Savely and Mr. H. D. Tate, of the United States Bureau of Plant Industry, found boll weevils in a cotton field near Roadside, on October 27, 1908. On November 2, 1908, Mr. W. D. Pierce, of the United States Bureau of Entomology, visited this field and found the weevils. He thinks that it was an accidental introduction due to the movement of materials from the infested territory into this county. During 1909 no cotton was grown upon the infested field. Mr. W. D. Pierce and the writer visited the nearby cotton fields during August and September, 1909, but found no signs of boll weevils. The weevils of 1908 had undoubtedly died out during the winter or had been unable to find cotton fields in the spring.

The line of infestation did not reach Yazoo county so far as we know until August, 1909. On August 28, 1909, the writer received boll weevils from a correspondent at Satartia. By the time frost had checked their spread the weevils had reached Yazoo City, and probably a few of them had crossed the Yazoo and Mississippi Valley Railroad south of Yazoo city. The boll weevils caused little damage in this county during 1909, but will probably spread entirely across the county during 1910 and may be numerous enough in the southwestern part of the county to do considerable damage.

**METHODS OF CONTROLLING THE BOLL WEEVIL.**

No one has discovered any panacea for the boll weevil and it is not likely that any will be discovered. However, years of experience and careful study have brought to light many facts in regard to the life history and habits of this insect. By taking advantage of some of these much can be done to lessen the damage of the boll weevil. We have the benefit of the experience of Texas and Louisiana and
should not be slow to profit by it. It is absolutely essential that every grower of cotton have an intelligent idea of the habits of this insect. Make sure that you are acquainted with the different stages of its life history. Read carefully all available bulletins or publications concerning this insect and verify the statements in these publications for yourself. Make observations for yourself as to which fields are most seriously damaged by the boll weevil, and try to determine the cause for any difference upon fields in the same neighborhood. Test different varieties of cotton under the same conditions so as to obtain the variety that does best on your farm under boll weevil conditions. Observe carefully the effects of early and late planting. There are hundreds of facts concerning the boll weevil that each farmer should find out for himself in order to more intelligently meet the situation and to continue to raise cotton on a profitable basis. It is our purpose to mention some of the most important practices that should be followed by all who expect to raise cotton in boll weevil infested territory. They are not necessarily remedies that will kill the boll weevil but are as a general thing good farm practices that will add to the production of cotton under any condition.

Destroy the stalks early in the fall.—The leading authorities upon the boll weevil all agree that this is the one most important step in the control of this insect. As soon as the boll weevils become so numerous that practically no more cotton will be produced, destroy the stalks so as to kill many of the insects and to cut off the food supply of the others. One can usually tell at a glance when a field has become badly infested by the fact that very few blossoms are to be seen. Hasten the picking of the cotton and as soon as it is picked out destroy the stalks. The earlier the cotton stalks are destroyed the fewer weevils will survive to damage the crop next year.

Mr. Wilmon Newell, Secretary of the Louisiana State Crop Pest Commission, carried on some very valuable experiments in 1908, that clearly show the value of the early fall destruction of the cotton plants. I shall quote freely from circular No. 28 of the Louisiana State Crop Pest Commission, in which Mr. Newell gives a summary of these experiments. He found that where the plants were destroyed before October 15, only 3 per cent of the weevils survived the winter to infest the next year’s crop. Where the cotton plants were destroyed between October 15 and October 27, about 15 per cent of the weevils survived the winter. Where the cotton plants were destroyed between November 1 and November 25, about 22 per cent of the weevils survived. Where the cotton plants were destroyed between Novem-
ber 25 and December 7, 28 per cent of the weevils lived through the winter, but where the destruction of the cotton plants was put off until the middle of December or later over 43 per cent of the boll weevils survived the winter and were ready to attack the next year's crop.

"These figures are so convincing that it is incomprehensible that any farmer should continue to try to grow cotton without picking out his crop early and completely destroying the cotton plants—stalks, leaves, bolls and roots—long before the first autumn frost."

"Destruction of the cotton plants before October 15th, in this instance, allowed but 3 per cent of the weevils to live until the crop of 1909 was subject to their attack. Against this small number of over-wintered weevils, as has been repeatedly proved by experience, the planter can make a good crop by the use of proper early-maturing varieties, and by the adoption of the intensive cultural methods. By leaving the cotton plants standing until after the middle of December last fall the farmer invited certain destruction of this year's crop, for when he starts the spring with 43 per cent as many weevils as he had the previous fall he cannot hope to make a crop by any known means under the sun."

"Arguments are still being made against early fall destruction of the cotton plants by those who steadfastly refuse to see the plain facts placed before them, but the farmers who are destroying the cotton plants early in the fall are making money growing cotton, and the fact remains despite all argument, that there is no other way in which a paying crop of cotton can be made under the conditions as they now exist in Louisiana and as they will exist for many years to come."

"Strangely enough, there are farmers who still argue that they cannot pick out the crop early enough to destroy the cotton plants by October 15th to November 1st. The alternative is to have no cotton to pick out. Those who cannot so arrange their farm management as to follow our recommendation in this regard are simply advised not to grow cotton at all, for unless the weevils are destroyed—by destroying the cotton plants—early in the fall, a profitable crop is impossible."

"Do not wait for sad experience to drive this lesson home to you. If you intend to grow cotton next year make all preparations now to pick out this year's crop as fast as it opens and destroy all cotton plants by cutting them down and burning them before October 15th or, at the latest, November 1st."
There are several methods by which the stalks may be destroyed, (1) by burning, (2) by cutting and plowing under, and (3) by pasturing. We shall discuss each of these methods.

(1) **Burning the stalks:** Plow the stalks up, then rake them into windrows and as soon as they are dry burn them. Cutting instead of plowing up the stalks is about as good a plan if the ground is plowed soon afterwards so as to make sure that no sprouts of cotton will start up from the old roots. Be careful to burn all of the cotton plants as hundreds of weevils may be kept alive on a few stalks. Do not allow the fire to spread as the burning of plants of any kind is a very bad agricultural practice. The soil is robbed of an immense amount of fertility every year by the burning over of our lands in Mississippi. Many good agricultural authorities even doubt the advisability of recommending the burning of the cotton stalks as they claim that in time the burning off of this fertility will do more damage than the boll weevil. However, there is no method so sure of destroying immense numbers of weevils and consequently lessening their damage the next year as the early burning of the stalks. Burning the cotton stalks destroys the weevils in several ways. Many adult weevils are killed, many eggs and larvae within the squares and bolls are killed; no weevils are produced late in the fall to be strong to live through the winter; the adults that are not burned will have no food and will be so weakened when winter comes that they cannot survive until spring.

(2) **Cutting and plowing under:** As early as possible go through the fields with a stalk cutter and then follow with a plow. This method has the advantage of not robbing the soil of any fertility, but on the other hand not so many boll weevils are killed as by burning the stalks. Many of the immature weevils in the squares and bolls will have opportunity to mature. However, if the plants are well covered with soil a large proportion of these weevils that would mature will probably never reach the surface, and the adult weevils would be entirely without food and would be so weakened as not to be able to live through the winter. The success of this method depends largely upon the earliness and thoroughness with which it is done.

(3) **Pasturing:** The writer has seen small cotton fields in Mississippi into which cattle had been turned early in October that were without a vestige of foliage by the end of that month. Under such conditions considerable benefit was undoubtedly derived from this method but there is always opportunity for the plants to sprout and
EARLY Versus LATE PLANTING IN THE CONTROL OF THE BOLL WEEVIL.

FIG. 10. The upper illustration shows a cotton field planted late and yielding nothing. The lower illustration shows a field on the opposite side of the turnrow on same plantation, planted early, properly treated, and yielding three-quarters of a bale per acre. (Hunter, Yearbook, U. S. Dept. of Agr., 1906.)
furnish food for the weevils. This method is not as thorough as either of the others and its use is of course very limited. There are comparatively few farms on which there are enough live stock to do much good. If the fields are ready for cattle to be turned into them they are also ready for the stalk cutter and the latter will do the work much faster. However, this method is recommended when on account of lack of labor or for other reasons it is impossible to destroy the stalks in any other manner.

**Plant on well drained land.**—It is absolutely essential to do everything possible to mature the cotton crop early in weevil infested territory. Poorly drained land cannot be made to mature cotton early. Some people assert that well drained lands will solve the boll weevil problem. Choose the best drained fields in which to plant cotton and do everything possible to improve the drainage of all the fields.

**Plant early.**—In order to get ahead of the boll weevil, that is to have the cotton crop mature before the boll weevils become numerous enough to destroy most of the squares and bolls, it is of course necessary to plant as soon as the soil is in proper condition. No definite date can be given for planting in any locality but plant as soon as the soil is in good shape and the weather is warm enough—the earlier the better.

**Varieties of cotton to plant.**—The best variety of cotton to plant under ordinary conditions may not be the best for boll weevil conditions. One must, of course, always keep in mind the productiveness and the other desired qualities of the cotton but it is very essential that an early maturing variety be used. That does not necessarily mean a variety that begins to blossom early but it means a variety that will produce the largest quantity of cotton at the earliest date. Other things being equal, early maturing is the most important factor to be considered.

A second matter to consider is the thickness of the "pods" or "husks" of the cotton boll. The varieties with thick pods have been found to withstand the attacks of the boll weevil better than other varieties. Therefore, try to choose a variety with a thick husk or pod. Other things being equal the thicker the pod the better.

A third matter to be considered in selecting a variety of cotton for boll weevil conditions is in regard to the rankness of the growth or the amount of foliage and consequent amount of shade produced. A rank growing variety with an abundance of foliage is not desirable for planting under weevil conditions. The shade prevents the
sun from reaching the ground under the plants where the fallen squares infested with boll weevil larvae are lying. If the sun is allowed to reach these squares, many of the weevils are killed by the heat. It takes but a small amount of observation of cotton fields in boll weevil infested territory to impress upon one the fact that the tall, rank growing, heavily foliaged plants are not desirable. These plants may do very well without the boll weevil but in the presence of this pest the yield from such plants is usually small.

Preparation of the soil.—Above all else the soil must be prepared so that the seed may be planted at the first opportunity. The early fall destruction of the stalks has cleared the fields so that there is little reason for delay. Deep plowing is to be recommended in the preparation of the soil, but after the plants are up-shallow cultivation should be practiced.

Fertilizers.—Experiments have shown that commercial fertilizers containing a high percentage of phosphoric acid generally hasten the maturity of the cotton plant. There are many soils that need this element to increase their fertility but with the advent of the boll weevil many soils in which the cotton does not mature early may be benefitted by the use of phosphates. It will pay each farmer to experiment in his own fields to find out just what benefit may be derived from the use of phosphates. Any fertilizer that will hasten the maturity of the plants should be used.

Cultivation.—The frequent and careful cultivation of cotton is even more essential under boll weevil conditions than otherwise. Frequent shallow cultivations should be the practice. Deep plowing is to be recommended in the preparation of the soil but after the plants are up the cultivation should be shallow and care should be always taken not to cultivate too close to the plants. The cutting off of the roots by deep or close cultivation causes the bolls to shed.

Dr. W. E. Hinds, now Entomologist of the Alabama Experiment Station, several years ago devised what is known as a chain cultivator. This is a V-shaped instrument that is drawn along the ground between the rows for the purpose of bringing the fallen squares and bolls from under the plants to the middle of the rows where the sun can reach them and the weevil larvae within them will be killed by the heat. It has been found that this chain cultivator makes a very good dust mulch and therefore performs a double function.

The practice of "laying-by" the crop should be discouraged in every possible way. Throwing the dirt from the middle of the rows
leaves hard surfaces from which the moisture evaporates very rapidly and consequently causes serious loss to the plants. It should be the endeavor of every cotton grower to keep a shallow dust mulch around the plants throughout the entire growing season. This can only be done by frequent and shallow cultivation.

Wide rows.—It has been shown that a great many of the infested bolls and squares fall to the ground. If the rows are wide so that the sun is allowed to reach these fallen squares and bolls, a large proportion of the boll weevil larvae will be killed. The practice of planting in wide rows is therefore most highly recommended. Another reason for wide rows is to give the plants plenty of room. Where they are not crowded the plants will mature earlier and this is an advantage where the boll weevil is present.

Pick the cotton early.—After the cotton has been matured early, do not waste any time in having it picked out. It is never desirable to have more cotton under boll weevil conditions than can be picked out by November 1. As soon as the cotton is gathered follow the previous advice of destroying the stalks at once.

Rotate crops.—As a general proposition it may be stated that weevils never do as much damage where proper methods of rotation are followed as where cotton is grown on the same fields year after year. It is a good practice to plant cotton each year in fields that are as far away from the previous year’s cotton fields as possible. The advantages to be derived from the rotation of crops are too numerous and too well known to need any discussion here but to these advantages may be added the fact that the practice assists in lessening the damage of the boll weevil.

Hand picking.—To a limited extent it may sometimes pay to have the weevils picked off during the early part of the season. Each weevil living in the early part of the season may be the ancestor of millions of weevils before frost. Where very cheap labor is available or where children may be employed it may pay to collect and destroy the adult weevils found upon the plants in the early part of the season. The infested squares should not be destroyed but should be placed in wire cages. A 16-mesh wire should be used (that is, there should be 16 meshes to an inch). If this sort of cage is used the parasites of the boll weevil may escape but most of the boll weevils will be held in.

Use of poisons.—Many supposed remedies and poisons for the boll weevil have been proposed but careful investigation has shown
that none of them are practical with the single exception of arsenate of lead. Paris green has been advocated but many tests have shown that although the Paris green will kill many weevils it injures the plants to such an extent as to cause smaller yields of cotton on the poisoned fields than on those not poisoned. In Louisiana Mr. Wilmon Newell and Mr. G. D. Smith have carried on many experiments with arsenate of lead. This substance promises to be of great assistance in controlling the boll weevil. It should be applied in the powdered form during the early part of the season so as to kill the first weevils that appear upon the plants. Several applications are recommended about the time the first buds appear—using 2 to 2½ pounds per acre when the plants are small but increasing this to 6 or 8 pounds when the plants become larger. Although the prospects are very bright for this substance becoming of great assistance to us in the future I should not advise anyone to use arsenate of lead who has not learned just how and when to apply it. The writer will be glad to hear from any people in this state who may wish to test this substance and will render them all possible assistance.

WEEVILS MISTAKEN FOR THE BOLL WEEVIL.

Thousands of people in this state have seen pictures of the boll weevil (figure 11). Many do not realize that there are other insects that resemble the boll weevil considerably in appearance and as a consequence whenever they see a weevil of any kind they feel confident that it is a boll weevil. The zeal with which many people have searched for the boll weevil is greatly to be commended. This zeal has been shown by the large number of insects that have been sent to us for identification. Almost all of the insects commonly found upon cotton have been sent in as well as hundreds of other insects somewhat resembling the boll weevil although not found upon cotton. The boll weevil is at least teaching the people to observe and many are learning about other insects which they had previously never noticed although they had passed them by for years. We are giving illustrations and short descriptions concerning some of the insects
that have been sent to us most often during the past year. The illustrations will generally show the difference between these insects and the boll weevil plainly enough so that the average farmer can distinguish them by comparing any insects that may be found with the illustrations.

Cocklebur weevil or Transverse baris (Baris transversa Say)—(Figure 12).—They are only known to feed within the roots and stalks of the cocklebur and in order to give them a name that may mean more to the average person we have been calling them "cocklebur weevils." These insects have been sent to us more frequently than any other one species. They have been received from all sections of the state from November until July, but particularly during the winter months. The eggs are probably laid within the stalk of the cocklebur early in the summer. During the late summer the grubs may be found within the stalks of these plants. They transform early in the fall as from November until spring the adult weevils may be found usually within the stalks just at the surface of the ground. The weevils are black in color, smaller and more rounded than the boll weevil. The adults are found most commonly at the time of the year when the boll weevils are very scarce.

Cowpea-pod weevil (Chalcodermus aeneus Boh.)—(Fig. 13).—During the summer months especially in the late summer and early fall great numbers of these weevils were received. They are about the size of the boll weevil but somewhat rounder in shape and of a jet black color. They breed in the pods of the cowpea and where cotton follows cowpeas they have been known to damage the young cotton plants just as they are coming up. However, it is rare for these insects to do any damage to cotton and they probably never do any noticeable injury to cotton after it is a month old.
White pine weevil (*Pissodes strobi* Peck.)—(Fig. 14).—As the name suggests this weevil probably confines its attacks to pine trees, often causing serious injury and sometimes hastening the death of the trees. They breed in the twigs and in the bark of the pine, and, as this tree is widely distributed, these insects have been received from many sections of the state. They are somewhat larger than the boll weevil, reddish brown in color with white spots on the posterior end of the wing covers.

Bloodweed weevil (*Lixus* sp.)—(Fig. 15).—These long slender weevils have been received at all seasons of the year. They are usually at least twice as long as the boll weevil and differ from it very much in shape. The snout is much shorter in proportion to the size of the body. These weevils may often be found by cutting open stalks of bloodweed or ragweed. There are several species that resemble each other very much in appearance but differ considerably in their habits.

Acorn weevil (*Balaninus victoriensis* Chit.)—(Fig. 16).—This is one of the nut weevils. They all resemble each other very much in appearance but differ considerably in size and in food habits, although they all feed upon nuts. The chestnut and the hickory weevils are probably not quite so numerous in this state as the acorn weevils. In ap-
pearance these insects resemble the boll weevil very much. They are usually somewhat larger and of a lighter color. As nut trees are often growing near cotton fields it is not strange that these insects are sometimes found upon cotton plants, but there are no records to show that they ever injure these plants. The nut weevils are frequently attracted to lights and it is not uncommon for these insects to come into houses at night on that account.

Ironweed weevil (*Desmoris scapalis* Lec.)—(Fig. 17).—This weevil resembles the boll weevil very much but has a more pointed appearance and has not the conspicuous spines on the fore legs that the boll weevils have.

Pepper weevil (*Anthonomus aeneotinctus* Champ.)—(Fig. 18).—This weevil is somewhat smaller than the boll weevil. It feeds upon peppers. Although this weevil has not been sent to us from this state it is likely to reach us at any time and is of some economic importance besides being mistaken for the boll weevil.

Flower weevils (*Centrinus* sps.)—(Fig. 19).—Often in the blossoms of cotton and many other plants small weevils are found that resemble the boll weevil very much in appearance. These are generally feeding upon pollen and nectar and are not known to injure cultivated crops. Most of these weevil are smaller than the boll weevil but some of them are just about the same size. As the adult boll weevils are also often found in the cotton blossoms it is not surprising that these flower weevils are mistaken for them.
Plum gouger (*Anthonomus scutellaris* Lec.)—(Fig. 20).—This is a well known pest to plums and apples. It is not known to injure cotton. In size it resembles the boll weevil considerably. It is occasionally mistaken for the boll weevil.

Coffee-bean weevil (*Araecerus fasciculatus* De G.)—(Fig. 21).—These weevils have been observed often in the southern half of the state but are probably to be found in all sections. The writer has found them breeding in partly decayed cotton bolls that have been injured by the pink boll rot of cotton (*anthracnose*). So far as is known these insects do not damage the living bolls. They are really scavengers and feed upon the dry or decaying bolls. There is no other insect that is more likely to be confused with the larva or grub stage of the boll weevil than this species. The boll weevil larva feeds only in living "squares" and bolls but the coffee-bean weevil is not known to attack any but the dried or decaying bolls. Another difference so far as the writer’s observations go is that the larvae of this species (Fig. a) are pink while the boll weevil larvae are white, but according to Mr. E. S. Tucker, who has probably studied this species more than any one else, the larvae are also generally pure white. Besides breeding in dried cotton bolls the coffee-bean weevils breed, as the name suggests, in aromatic beans and also in corn stalks and dried fruits. They have also been known to damage growing corn stalks.
adults (Fig. b) also resemble the boll weevils considerably upon a superficial examination and are found upon the old diseased bolls.

Corn bill bugs (*Sphenophorus* sps.) — (Fig. 22). — Although these insects are often injurious to corn they are not known to damage cotton. They are most likely to injure corn that has been planted in marsh land by feeding upon the stems and leaves. They are usually larger than the boll weevil and have a rough appearance and the body is usually dirt colored. These insects have been sent to us from all sections of the state and are likely to be found at any time of the year.

Imbricated snout beetle (*Epicaerus imbricatus* Say) — (Fig. 23). — This species may easily be distinguished from the boll weevil by its short broad snout and by the stripes across its wing covers. These snout beetles are general feeders and have been known to damage a great many different kinds of plants but they are not known to damage cotton.

Other weevils or snout beetles.—Many other snout beetles are often mistaken for the boll weevil. Several of these should be mentioned, although they are not illustrated in this bulletin, as they are much oftener found than some of the weevils mentioned above.

Pine bark weevil (*Pachylobius picivorus* Germ.) — This large weevil has been frequently sent to us during the winter and early spring months. The larvae or grubs feed under the bark of pine stumps and recently felled trees. They may also sometimes attack dying pine trees that are still standing and undoubtedly hasten the death of the trees. The adult weevils are several times as large as the boll weevil but vary considerably in size as well as color. They are often nearly
jet black but sometimes brownish and often have whitish spots. They always have a resinous appearance.

**Plum curculio** (*Conotrachelus nenuphar* Hbst.)—This well known pest is occasionally mistaken for a boll weevil. Although it is the worst pest attacking peaches and plums in this state, it is perfectly harmless so far as cotton is concerned. It does not resemble the boll weevil enough to confuse anyone who will take time to compare the insect with a picture of the boll weevil. They are about the same size and they both have the snout, like all other weevils, but the plum curculio has a rough appearance that should easily distinguish it from the boll weevil.

**Grain weevils** (*Calandra* sps.)—These small brownish black weevils that attack corn, rice, and other stored grain are much smaller than the boll weevil. Although they are very serious pests injuring stored grains they do no damage to cotton. They are so well known that it is seldom they are mistaken for boll weevils.

**OTHER INSECTS MISTAKEN FOR BOLL WEEVILS.**

Besides the true weevils or snout beetles that resemble the boll weevil considerably in structure there are many other insects often mistaken for the boll weevil. These have not the slightest resemblance to the boll weevil and the only excuse for their being mistaken for it is the fact that they are found upon cotton.

![FIG. 24: Cotton sharpshooter, Homalodisca triquetra Fab. (Insect Life.)](image)

**Cotton sharpshooter** (*Homalodisca triquetra* Fab.)—(Fig. 24).—These insects as well as several other sharpshooters often occur on cotton and many times have been mistaken for boll weevils. These insects are not even beetles and would probably never be mistaken for boll weevils by people who have ever seen pictures of this pest. The sharpshooters are said to sometimes do considerable damage by puncturing the bolls, squares, and young growth. They have sucking mouth parts with which they pierce the tissues of the plants and suck out
These insects are very active; when a person approaches a plant upon which they are at work they will either fly away or move to the opposite side of the twig so as to be out of sight. The sharpshooters are found on many other plants besides cotton.

The cotton stainer (*Dysdercus suturellus* H-Sch.) — (Fig. 25).— These insects are often known locally as "red bugs." They are sometimes found upon cotton and are said to damage the plants by piercing the stems and bolls and sucking out the juices and also by staining the cotton in the open bolls. In this state these insects have not been often confused with the boll weevil.

Click beetles, or snapping beetles (Fig. 26).—These rather long flat beetles are well known to most people. They receive their names because when placed upon their backs they will "snap" into the air. Also when held against a flat surface they will "snap" or "click", as it is often called, by raising the fore part of the body and bringing it suddenly against the surface. These beetles are often found in cotton bolls that have been partially destroyed by boll worms. It is not thought that they do any damage to cotton but people finding them upon cotton plants sometimes mistake them for boll weevils. The larvae of these click-beetles are wire-worms and often do much damage to the roots of plants.

Cotton stalk-borer (*Alaxia crypta* Say)—(Fig. 27).—This beetle is not known to be of any particular economic value and the writer has never found it in this state. However, it undoubtedly occurs in all parts of Mississippi and is probably sometimes mistaken for the boll weevil. The writer has talked to several cotton planters who insist that the boll weevil larvae sometimes feed within the stalks of the cotton-plants. These men have undoubtedly seen the larvae of this
beetle and have mistaken them for boll weevils as the latter are not known to ever feed within the stalks.

**Euphoria beetles (Euphoria sp.)**—(Fig. 28).—These large beetles shown in the illustration considerably enlarged and also natural size, are often found feeding upon decaying bolls. The writer has observed these insects upon cotton very often but has never found that they do any injury. They usually follow the boll worm or some other insect that has partially eaten the boll. The Euphoria beetles are much larger than the boll weevils and have very slight resemblance to them yet they have often been sent to us by people who seemed to think that they were boll weevils.

**Southern corn-root worm** (*Diabrotica 12-punctata* Oliv.).—This is the “bud-worm,” “drill-worm,” or “spiker,” that is such a serious pest to young corn while in the grub or larva stage. In the adult stage it is a yellowish green beetle with 12 black spots on its wing covers. During the summer and fall beetles are very common in cotton blossoms and upon the leaves. They probably feed largely upon the pollen and nectar of flowers but may do some damage by feeding upon leaves. They are often mistaken for the boll weevil but the great difference in color ought to distinguish them at a glance.

**The soldier beetles** (*Chauliognathus pennsylvanicus* De G. and *marginalis* Fab.).—These beetles are very similar to the “fire-flies”
or "lightning-bugs"; they have soft bodies and are yellow and black in color. The beetles are found around and within the blossoms and upon the leaves of many plants. After observing many of these beetles upon cotton in all parts of the state, the writer does not believe that they ever cause any injury. Careful search through the entomological literature at his disposal also fails to show that any other observers report these beetles as being injurious. They feed largely upon the pollen and nectar. During the season of 1909 they were often thought to be the cause of "shedding of the bolls." However, they were probably entirely innocent as the unfavorable weather conditions undoubtedly caused this trouble. Instead of being injurious this species should be regarded as beneficial as the larvae are known to destroy many noxious insects.

The dusky plant-bug (Calocoris rapidus Say).—Many of the plant bugs are occasionally found upon cotton but this species seems to prefer this plant and is a very common insect in this state. When numerous it probably causes some damage but the writer has never seen plants that appeared to be seriously damaged by this insect. The dusky plant-bug is about half an inch long when full grown, moves very rapidly, and is therefore rather difficult to catch but has a soft body so that it is very easily killed when caught.

The leaf-footed plant-bug (Leptoglossus phyllopus Linn.).—This is a large dark colored bug, with a single white stripe running across the back. It has a characteristic disagreeable odor and receives its name because of the flattened appearance of part of its hind-legs. Because of their size these insects probably do some damage when they pierce the forms and bolls, but this is not common. They have occasionally been mistaken for boll weevils.

Boll-worm (Heliothis obsoleta Fab.).—This insect has for a number of years probably done more damage to cotton in Mississippi than any other one insect pest. It damages cotton by eating holes through the large bolls and completely devouring the small bolls. It has probably been here as long as cotton has been grown and its work is too well known to need much discussion. It would not be mentioned except that some people have mistaken the injury caused by the boll worm for the work of boll weevils. Usually the boll-worms can be found within the bolls that they are destroying. They differ from boll weevil grubs in having legs and in not being white in color. The boll weevil grubs can not crawl from one boll to another. There is also some confusion in regard to the names, "boll worm" and "boll weevil,"
by people who are not acquainted with them. The boll worm seems to prefer corn to cotton as a food. Many farmers make it a practice to plant some late corn in the vicinity of their cotton fields so as to attract the boll worm moths. They lay their eggs upon the corn plants and when the young boll worms hatch out they will feed upon the corn and the cotton is therefore not injured.

Cotton-worm (Alabama argillacea Hbn.)—This insect is often called the "army worm," or "leaf-worm." Twenty years ago it was a very serious pest. At the present time it seldom becomes numerous. Occasionally there are outbreaks late in the season and the plants may be defoliated. This insect is not often confused with the boll weevil but is often confused with the boll worm mentioned above.

PUBLICATIONS.

There has been a great deal published regarding the boll weevil during the past fifteen years. Most of these publications give information concerning the life history, habits, and methods of controlling the boll weevil. This information has practically all been obtained by the entomologists employed by the United States Department of Agriculture and by the states of Texas and Louisiana.

The following publications would be most useful to the people of Mississippi who wish to obtain more information concerning the boll weevil and other cotton insects, or concerning the culture and varieties of cotton. All of these publications are for free distribution except the two for which the price is given. They may be obtained by writing directly to the addresses given.

1905. The Mexican Cotton Boll Weevil, by W. D. Hunter, and W. E. Hinds, Bulletin No. 51, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C. This is probably the most complete work upon the boll weevil. It can be obtained from the Superintendent of Documents, Washington, D. C., for 22 cents, or you may be able to obtain it free by writing to your congressman.


1905. Miscellaneous Cotton Insects in Texas, by E. D. Sanderson, Farmers Bulletin No. 223, U. S. Department of Agriculture, Washington, D. C. (This bulletin discusses other cotton insects but not the boll weevil.)

1907. Some Factors in the Natural Control of the Mexican Cotton Boll Weevil, by W. E. Hinds, Bulletin No. 74, Bureau of Entomology, U. S. Department
of Agriculture, Washington, D. C. (This may be obtained for 18 cents from the Superintendent of Documents, or free from your congressman.)

1907. The Most Important Step in the Control of the Boll Weevil, by W. D. Hunter, Circular No. 95, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.


1908. Cotton Culture in Mississippi, by W. L. Hutchinson, Bulletin No. 117, Mississippi Agricultural Experiment Station, Agricultural College, Miss.

1908. Farmer's Institute Bulletin 1907 and 1908, by E. R. Lloyd, Bulletin No. 120. Mississippi Agricultural Experiment Station, Agricultural College, Miss. (This bulletin contains articles by Mr. W. D. Hunter, Mr. Wilmon Newell, Mr. R. L. Bennett, and others, and should be in the hands of every farmer in Mississippi.)


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**HOW TO MAIL INSECTS.**

Questions regarding insects will always be gladly answered. When possible all communications should be accompanied by specimens with some of their food. Never send insects in a letter, but enclose them in a tight tin, wooden or strong pasteboard box. It is not necessary to leave any holes for breathing. Always write your name and address plainly on the outside of the package. In a letter accompanying the insects tell all you have noticed as to their feeding habits, abundance, first appearance, etc.

Address all communications to

The Entomologist, Agricultural College, Miss.
AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

BULLETINS.

No.
73—Texas Fever.
83—Report of Work at McNeill Branch Station for 1903.
84—Report of Field Work at College Station for 1903.
86—Insects Injurious to Pecans.
90—San José Scale.
91—Inspection and Analyses of Commercial Fertilizers.
92—Beef Cattle.
93—Peach and Plum Culture.
95—The Dairy Cow.
96—Insects and Diseases Liable to be Introduced into Mississippi.
98—Varieties of Cotton.
99—Fertilizers.
100—Farmers' Institute Bulletin, 1906.
104—Inspection and Analyses of Cotton-seed Meal.
105—Inspection and Analyses of Commercial Fertilizers.
107—Pork Production at the Delta Station.
109—The Adornment of Rural School Surroundings.
110—Report of Work at the Holly Springs Branch Station for 1907.
111—Experiments in Feeding Dairy Cows.
112—Silage vs. Hulls and Meal.
113—Silage vs. Hulls and Meal.
114—Inspection and Analyses of Cotton-Seed Meal.
115—Inspection and Analyses of Commercial Fertilizers.
117—Clearing Pine Lands.
119—Report of Work at the Delta Branch Station for 1907 and 1908.
120—Farmers' Institute Bulletin, 1907 and 1908.
121—Experiments in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
123—Inspection and Analyses of Commercial Feeding Stuffs.
124—Pecan Culture.
125—Inspection and Analyses of Commercial Feeding Stuffs.
126—Inspection and Analyses of Commercial Fertilizers.
127—Inspection and Analyses of Cotton-Seed Meal.
128—Inspection and Analyses of Cotton-Seed Meal.
129—Sugar Cane for Syrup Making.
130—Peanuts.
131—Snap Beans.
132—The Soils of Mississippi.
133—The Inspection and Analyses of Commercial Feeding Stuffs.
134—Broom Corn.
135—Cotton, 1909.
136—Feeding Beef Steers on Cotton-Seed Meal, on Pasture.
137—Inspection and Analyses of Commercial Feeding Stuffs.
138—Inspection and Analyses of Commercial Feeding Stuffs.
139—Boll Weevil in Mississippi, 1909.
140—Cotton Diseases of Mississippi.
141—Control of Diseases of Flowers, Vegetables and Fruits.

CIRCULARS.

No.
21—Inspection and Analyses of Commercial Fertilizers.
22—Inspection and Analyses of Commercial Fertilizers.
23—Inspection and Analyses of Commercial Fertilizers.
25—Inspection and Analyses of Commercial Fertilizers.
26—Inspection and Analyses of Commercial Fertilizers.
27—Inspection and Analyses of Commercial Fertilizers.
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