

DEPARTMENT OF AGRICULTURE.  
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# REPORT

ON

## INSECTS INJURIOUS TO SUGAR CANE.

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PREPARED, UNDER THE DIRECTION OF THE COMMISSIONER  
OF AGRICULTURE,

By J. HENRY COMSTOCK, Entomologist.

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# INSECTS INJURIOUS TO AGRICULTURE.

## THE SUGAR-CANE BEETLE.

(*Ligyrus rugiceps* LeC.)

Order, COLEOPTERA ; family, SCARABAEIDAE.

A stout black beetle 17 millimeters ( $\frac{2}{3}$  inch) long, boring into the stalk of sugar cane under the surface of the ground.

This, the most serious insect enemy of the sugar cane known in the United States, has created great anxiety in those localities in which it has become destructive. We, therefore, have made an effort to learn all that is possible respecting its life history, and the most practicable ways of preventing its injuries. Much, however, remains to be discovered; and this account is published for the purpose of placing before the sugar planters what is known respecting this pest, and to indicate the lines of investigation which it is important should still be followed.

It is hoped that those who have opportunities for making daily observations, and who are really the ones most interested in the matter, will help us to clear up the life history of the insect, and will aid us by conducting experiments in protecting their crops from its ravages. The department will do all in its power to accomplish these ends; but its efforts can be greatly facilitated by the co-operation of those planters whose fields are infected by the beetle.

The principal source of our present information respecting this insect, in addition to what has been learned through correspondence with planters, is the results of an investigation made during the month of March, 1881, by my assistant, Mr. L. O. How-



ard, who was sent to Louisiana by the department for the purpose of studying this and certain other important insects.

#### HISTORY.

The cane beetle was first scientifically described by LeConte, in 1856, from specimens received from Georgia, and has since been known to collectors as rather a rare Southern insect. It has occasionally been known to economic entomologists as slightly damaging corn, and we believe that it has also been found to injure grasses (American Entomologist, III, 130). There can be no doubt but that it was known to planters in Saint Mary's Parish, Louisiana, as a sugar-cane enemy in years previous to the war, but we are unable to find that anything was published about it at the time. It seems to have been unnoticed for a long term of years, until in 1876 it again appeared about Franklin. The plantation owned by Mr. L. Swamsteadt was injured to some extent that year, and still more so the two following years. In 1879 the loss was slight, but the beetle was found over quite a large extent of country. In the spring of 1880, after a remarkably open winter, the beetle appeared in force. It damaged Mr. Swamsteadt's crop to the extent probably of a loss of 200,000 pounds of sugar. The crops upon the plantations of Messrs. Edonard Celon, D. Caffrey, Charles Walker, Daniel Thompson, and many others, within a range of fifteen miles or so of Franklin, were also damaged to a greater or less extent, but none of them so severely as that of Mr. Swamsteadt. This gentleman calculates that his loss in three years from the beetle has reached \$25,000.

#### DESCRIPTION OF THE BEETLE.

The largest specimens of the beetle will measure five-eighths of an inch in length, the smaller ones somewhat less. The color is jet black when fully matured, the individuals which have just metamorphosed being somewhat lighter. The head and fore part of the body (*thorax*) appear smooth, but with a hand-lens the head is seen to be roughly shagreened, while the thorax is covered with minute, round, impressed dots. The hind body (*abdomen*) is covered by the wing-cases (*elytra*), which have several longitudinal impressed lines and also many impressed dots, such as are seen on the thorax. The front legs are broadened and the middle joint (*tibia*) is spread out fan-like and has four large tooth-like projections.

#### METHOD OF ATTACK.

The beetles make their appearance in early spring, and, as the experience of the present spring has proved, if the cane is not yet up and ready for them, they will bore into the stubble and may also work into the seed cane, where their injuries are greatly to be feared, as they will, preferably, without doubt, take the eyes to any other portion of the

hard cane. Mr. F. Dumartrait found several of the beetles working in stubble upon Mr. Swansteadt's plantation on March 17, this being their first noticed appearance in this season. In previous years, however, the presence of the beetles was first indicated by the withering of the top section—the bud leaves of the cane—after it was well up. These leaves finally died entirely, and with but slight effort the section could be pulled out. Such stalks, upon examination, showed the beetles in greater or less numbers below ground, burrowing to the center, in many cases being entirely concealed within the stalk, in others with only the head and thorax buried. So abundant were they last season that no less than 57 were counted in an 18-inch section of a row, and they often averaged 13 to a single stalk. In May and June they were observed flying very abundantly at night, and the testimony that they were greatly attracted by light seems to be irrefutable. They were reported to have left the cane entirely and to have disappeared in late June by many planters, but upon Mr. Swansteadt's place they were found all through the summer, though the damage grew less as the cane grew larger and tougher. One specimen was found alive in seed-cane as late as December.

In many fields where the beetles had not been remarkably numerous, after their disappearance in June the cane suckered so well as almost to repair the damage done by them. In others, however, all cane was completely killed, and in some cases it was plowed under in midsummer and the fields planted to corn. In such cases it is worthy of remark that the beetle destroyed the corn in the same way that it had the cane.

#### EARLY STAGES OF THE INSECT.

It was considered as among the probabilities that the earlier stages of the beetle (of which the first is undoubtedly a white grub living under ground upon living or decaying vegetation or in rotting wood) would be found at the roots of the cane, and our correspondents were requested to search for them there. As an answer to this request came a number of pupæ found about cane roots, from several gentlemen, but these upon being reared to the adult state proved to be an allied Scarabæid beetle (*Phyllophaga glabripennis*, LeC.), which has never been known to injure cane. Mr. Howard made a most thorough search for the earlier stages of the beetle. In the earth at the roots of the cane two species of Scarabæid larvæ, or "white grubs," were found, but that they were the larvæ of the cane beetle is very improbable, from the fact that the same two species were also found in Plaquemines Parish, where the beetle is unknown; and that they injure the roots of the cane to any extent is also negatived by the fact that they were also found as abundantly in the soil of the "headlands" or "turn-rows," and also in the lawn in front of the house, as well as in land grown to cow-pease last season. It is probable that these larvæ will be found to be the young of the beetle mentioned above, *Phyllophaga glabripennis*, and perhaps

of *Lachnosterna fusca*, var. *puncticollis*, which was also found by Mr. Howard alive and hibernating in the earth among the stubble. The soil in every condition of cultivation in injured localities was carefully examined, with no results so far as *Ligyris* was concerned, and we can say with considerable certainty that the insect in any stage of growth is not to be found in the fields during the winter. The most natural supposition after this conclusion is that the metamorphoses are undergone in the surrounding swamps, and that the adult beetles make their appearance in early spring and fly to the cane plantations.

But contrary to this conclusion is the following fact: On May 22 Mr. W. J. Thompson, of Calumet plantation, Bayou Teche, sent to the department, among other insects collected at the roots of cane where the beetles were very abundant, a few very young white grubs, of a species different from any sent by any other correspondent, and also differing from any which have been found since. These were placed in a breeding-cage under roots of grass. On August 2 one of the grubs was observed to have changed to a pupa in an oval cavity two or three inches below the grass roots, and on August 24 a crippled beetle was found in the cage, which, though badly deformed, seems without doubt to be a true cane beetle. Of course this single instance needs confirmation, and we would earnestly request that during the months of June and July search should be made among the roots of cane, and that all white grubs found be forwarded to the department for rearing.

#### CHARACTER OF FIELDS MOST INJURED.

It was puzzling at first to account for the fact that the injuries of the beetles were confined to certain sections of fields, or to plantations the surroundings of which and the method of cultivation in which seemed identical with non-injured sections, but it was noticed that there was quite a marked difference in the character of the soil, that of the injured portions being more sandy and friable, while that of the other parts was of the common heavy, clayey, alluvial soil—soil in which the experienced person on turning it over would at once reject the idea of finding insects. The former, found only upon the highest parts of the plantation, is soft and loose, easy to burrow in, and when examined is found teeming with insect life. Mr. Swamstead's plantation, the one worst damaged, is remarkable for this peculiarity of the soil; while all the testimony so far gathered upon this point seems to confirm the fact that *Ligyris* works almost exclusively on cane grown in soil of this character.

One of our correspondents made mention of the fact that previous to 1880 ratoon cane had been principally damaged, while in that year both ratoon and plant were equally eaten. This fact it was which first suggested the idea that the beetles bred at the cane roots, and, hibernating in the stubble, naturally first appeared there and did most harm. The explanation of the fact probably is, however, that in ordinary seasons the beetle appears before the cane is up, and takes to stubble as the only

food appearing. Last year, however, the cane being so very forward upon the appearance of the beetle, both stubble cane and plant cane were at his disposal.

#### REMEDIES.

Until the earlier stages of the beetle can be more fully studied than they have been, we shall have to confine our energies to destroying the adult insect. The first method of destroying it is suggested by the readiness with which it is attracted to light; the testimony that it is so attracted being very conclusive. Hence we shall advise the use of trap lanterns. It has been urged in many cases that the use of these lanterns attracts from surrounding plantations many more insects than are destroyed; but even supposing this to be true, it would only be necessary to secure unity of action among a few neighboring planters having the same interests, and the results would certainly far more than repay the expenditure. It is a very easy matter to experiment in this direction, and such experiment should be made. The success had with trap-lanterns in Central Texas, in protecting the cotton crop from cotton-worms and boll-worms as mentioned in the Report on Cotton Insects, p. 263, would seem to be a surety for their probable success here. The form of lantern in use there is very simple. The whole apparatus consists of three pieces; 1st, a shallow tin pan 15 by 10 inches; 2d, a common kerosene lamp with a half-inch wick and large enough to burn all night; 3d, a common lantern top large enough to place over the lamp and protect it from wind and rain. The lamp is placed in the middle of the pan and the latter filled with water, on which has been put a small quantity of coal oil. The whole thing is placed upon a post high enough to be above the top of the crop. The cost of a lamp is 50 cents, and the cost of burning it and labor about 35 cents a month. A great many patent lanterns have been devised, many of them very complicated, but the simple ones seem to work just as well. A simple closed tin receptacle for oil, with a wick tube and soldered to the bottom of a pan, the whole mounted on a stake which can be driven into the ground, is often used. It will not be necessary to figure any of the lanterns which have been patented, as any planter can devise one on the above principle which will meet all requirements. There is no doubt whatsoever but that the very best substance to put into the pan is water, with a tablespoonful or so of kerosene oil. If a beetle, in the course of its flight about the lamp, once falls into the oil on the surface of the water, its death is assured. The water is used simply to economize the oil.

Considerable has been said among the planters of the Teche region with regard to the use of lime as a protection against the cane beetle. In fact we learn that this substance was placed by one planter around the roots of infested cane during the summer of 1880, with the apparent effect of driving the beetles away. But as they also disappeared about this time upon plantations where this substance had not been used, the experiment cannot rank as a conclusive one. Many planters

have signified their intention of experimenting with this substance the present season, and one sowed a quantity of lime with his seed cane as he planted it last fall, with the idea of keeping the beetles away, but it seems probable that its influence will have become dissipated by the time the beetles make their appearance. It will be best to postpone the planting of the infested portions of the field until spring, and then it is possible that the sowing of lime with the seed may prove of benefit. To experiment with lime upon stubble cane, it seems to us that it should be sown as soon as the cane begins to appear above ground.

### THE SUGAR-CANE BORER.

(*Chilo saccharalis*, Fabr. [*Diatraea sacchari* Guilding].)

Order, LEPIDOPTERA; family, PYRALIDAE.

Boring into the stalk of sugar cane and making a longitudinal burrow from 2 to 6 inches long, a white cylindrical larva, over an inch long when full-grown, transforming within the burrow, and eventually becoming a light-brown moth, expanding about an inch and a quarter.

#### HISTORY.

For many years the sugar-cane borer has proved very destructive to cane in the West Indies. Several of the earlier writers upon cane culture mention its ravages, which appear to have been particularly marked in the Windward Islands, especially in Guadaloupe, in 1785 and 1786. The borer moth was first scientifically described



by Fabricius, in 1793, as *Pyralis saccharalis* (Ent. Syst, III., ii, 338), and was afterwards redescribed by Rev. Lansdown Guilding, a resident of Saint Vincent, Windward Isles, as *Diatraea sacchari*, in an essay upon the habits of the borer, for which he was awarded the Ceres gold medal of the London Society of Arts (Trans. Soc. Arts,

XLVI, 143). About 1850 the borer appeared in Mauritius, and was the occasion for an article upon its habits by Westwood, in the *Gardiners' Chronicle* (1856, p. 453), and which is the best of the very few published accounts.

In the United States the borer appears to have attracted but little attention, and we cannot find that any articles have been published upon it. That it has existed in Louisiana, however, for many years is beyond doubt. Dr. J. B. Wilkinson, of Plaquemines Parish, states that in 1857 the borers were very





abundant along the Lower Mississippi, the crop upon one plantation being utterly destroyed, as the canes broke to pieces upon cutting. He also informs me that one of the earlier writers upon the West Indies has recorded the observation that they were abundant only upon plantations near the sea-coast, and says that he has noticed the same thing in our country.

The borer was first received at the department, in 1878, from Mr. W. W. Pugh, of Assumption, who evidently considered it a rarity, and in October, 1880, a second specimen was received from the same gentleman.\* In February, 1881, a single worm taken from seed cane was forwarded by Dr. Wilkinson, with the statement that it had considerably damaged his crop in the previous year. From the observations of Mr. Howard during his trip in March, and from information gathered from other sources, we may state the following concerning the habits and life history of the borer.

#### HABITS AND LIFE HISTORY.

In early spring the parent moth lays her eggs upon the leaves of the young cane, near the axils, and the young borer hatching in the course of a few days, penetrates the stalk at or near the joint, and commences to tunnel upwards (invariably?) through the soft pith. The eggs, which, however, we have only seen upon corn, are flat and circular, 1<sup>mm</sup> (one-twenty-fifth inch) in diameter, and are white when first deposited, turning yellow as they approach the hatching point. The growth of the "borer-worm" must be very rapid. Specimens in corn stalks reared at the department, and which labored under the disadvantage of dry food and cool temperature, nevertheless reached their full growth in 30 days; and in midsummer in the South these larvæ will doubtless develop much more rapidly. The borers are quite active, and occasionally leave their burrows and crawl about upon the outside of the stalk, seeking another place to enter. This accounts for the numerous holes, differing widely in size, to be seen upon the outside of a badly-infested stalk. The full-grown borer is about an inch long, rather slender, nearly cylindrical, and cream white in color, with a yellow head and black mouth parts. Upon attaining its full size it bores to the outside of the cane and makes a large round hold for its future exit—a hole which is usually at least 5<sup>mm</sup> (one-fifth of an inch) in diameter. It then retires into its burrow and transforms a short distance from the opening into a slender brown pupa, three-quarters of an inch long. The pupa state lasts but a few days, and then the moth makes its exit. The moth has a spread of wings of about an inch and a quarter, and is of a light grayish brown color. With the female moth the hind wings are of nearly the

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\* During the summer of 1880 specimens of what is probably the genuine cane borer was received from South Carolina as injuring *corn*, and from pieces of the stalk sent it was seen to affect the corn in precisely the same manner as cane. It was also received from Georgia, with a similar account of damage to corn. A full account will be found in the department report for 1880.

same color with the fore wings, but with the male the former are silvery white.

It is impossible to estimate, at present, the number of broods, but there are several in the course of the season. Where the insects have been abundant, towards the end of the season the canes present a sadly damaged appearance; in some of them every section has had two or three of the borers at work, rendering them, of course, worse than useless. It is to be observed also that even in canes in which but one or two of the borers have operated, the other joints are very apt to become diseased, and seed cane which has been tunneled by the worms naturally mildews and decays much more readily than the sound cane.

#### AMOUNT OF DAMAGE.

Last year (1880) the cane borers were very abundant in various parts of Plaquemines Parish, and we also heard of their presence in Assumption and Saint Mary's Parish. On questioning several planters in the latter parish, it was learned that the borer has been known there for years, but has never been sufficiently abundant to attract especial attention, and most of the planters knew it only by its holes in the cane. The very early spring of 1880 and the open winter which preceded it, while forwarding the crop, were also favorable to the hibernation and rapid development of the worms. Upon Dr. Wilkinson's plantation (near Wood Park, parish of Plaquemines), fully 10 per cent. of the canes were injured, and in some places, where the damage was greatest, as high as 30 per cent. The crops upon other plantations in that vicinity were also injured as much. The loss would have been felt quite severely had it not been such an extremely favorable cane year.

#### REMEDIES.

According to our present information, the cane borers hibernate almost exclusively in the larva or "worm" state. During the winter they are to be found most abundantly, of course, in the seed cane, but also in the discarded tops, and also to a slighter extent in the stubble. We cannot hope, of course, to exterminate the insect, owing to the extreme difficulty of fighting it in the stubble, but the number of larvæ which hibernate in this place is so small that, supposing the others killed off, the borer can be well kept in subjection. It is the custom upon most plantations to plow the tops under for fertilizers, but if the plan of burning them during the winter were universally adopted, many of the borers would doubtless be killed which otherwise would help to start the next summer's brood.

The question of dealing with by far the larger number, which are to be found in the cane stored away for seed, now remains. In such cane as is planted in the fall it is reasonable to suppose that the borer will not be able to develop, or if it should develop that the moth will not

be able to force its way through the wet heavy soil above it, especially where the system of rolling after planting is followed. Why should not the same reasoning apply to such seed cane as is laid down in furrows at the time of harvesting? It would depend, of course, upon the amount of earth with which it could be covered without danger from mildew and decay. After a bad worm year all seed cane should be laid down in this way and not left openly in "flat mat," which allows of a safe hibernation and an easy natural escape of the moth. The cane should be covered as deeply as is safe in order to more effectually stop the egress of the moth, and in planting the ensuing spring, only so much should be uncovered at a time as is necessary for immediate use. In harvesting in the fall also such canes as are worst infested should be thrown aside with the tops, to be burned during the winter. Moreover, inasmuch as certain parts of a plantation are always damaged more severely than others,\* the seed to be kept through the winter should be selected from other localities and from amongst the very best and least-damaged cane. We cannot insist too strongly upon the necessity of following this latter course. If these suggestions are acted upon, we think that the damage from the borer will be very greatly lessened.

NOTE.—We are anxious to get the materials for a very complete life history of the cane borer, and would therefore solicit specimens at all times of the season. To any one signifying his willingness to send us specimens we will gladly send the requisite mailing boxes and stamps.

\* Such parts are the lower portions, where the cane gets an earlier start, and also next the draining ditches where the moths find an excellent harboring place during the day amongst the rank vegetation.





