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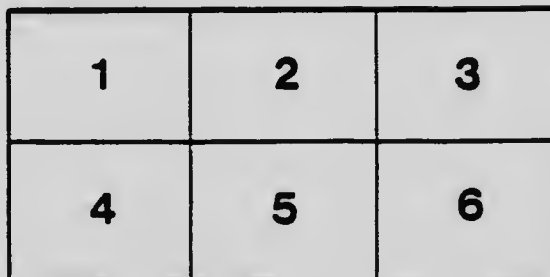
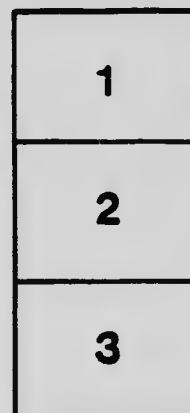
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DOMINION OF CANADA  
DEPARTMENT OF AGRICULTURE  
EXPERIMENTAL FARMS

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DIVISION OF ENTOMOLOGY

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# THE CHINCH BUG IN ONTARIO

BY

H. F. HUDSON,  
*Field Officer.*

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ENTOMOLOGICAL CIRCULAR No. 3.

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Published by authority of Hon. MARTIN BURRELL, Minister of Agriculture, Ottawa, Ont.

OTTAWA  
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1914

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**DOMINION EXPERIMENTAL FARMS.**  
Director, J. H. GRISDALE, B.Agr.

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**DIVISION OF ENTOMOLOGY.**

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*Assistant Entomologist for Forest Insects*—J. M. SWAINE, M.Sc., B.S.A.

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**NOTE.**

All inquiries relating to insect pests, and packages (up to five pounds in weight) containing specimens, may be mailed "Free" if addressed to the Dominion Entomologist, Central Experimental Farm, Ottawa.

In all cases where it is possible, living specimens of the insects should be sent inclosed in a strong wooden or tin box to prevent damage in transit. Living insects should be supplied with a liberal quantity of their food plant, and in all cases they should be carefully packed.

The name and address of the sender should be written on the outside of the package, and a letter giving as full details as possible should in all cases accompany insects sent in for report.

The Honourable  
The Minister of Agriculture,  
Ottawa.

SIR,—I have the honour to transmit herewith, for your approval, Entomological Circular No. 3, entitled "The Chinch Bug in Ontario," by Mr. H. F. Hudson, Field Officer of the Division of Entomology.

The destruction of crops in the United States caused by the Chinch Bug is extremely heavy and, with a view to the timely collection of data regarding the life-history, habits and control of this insect in Canada, Mr. Hudson was instructed to make a special study of an outbreak occurring in western Ontario. The results of his observations are embodied in this circular.

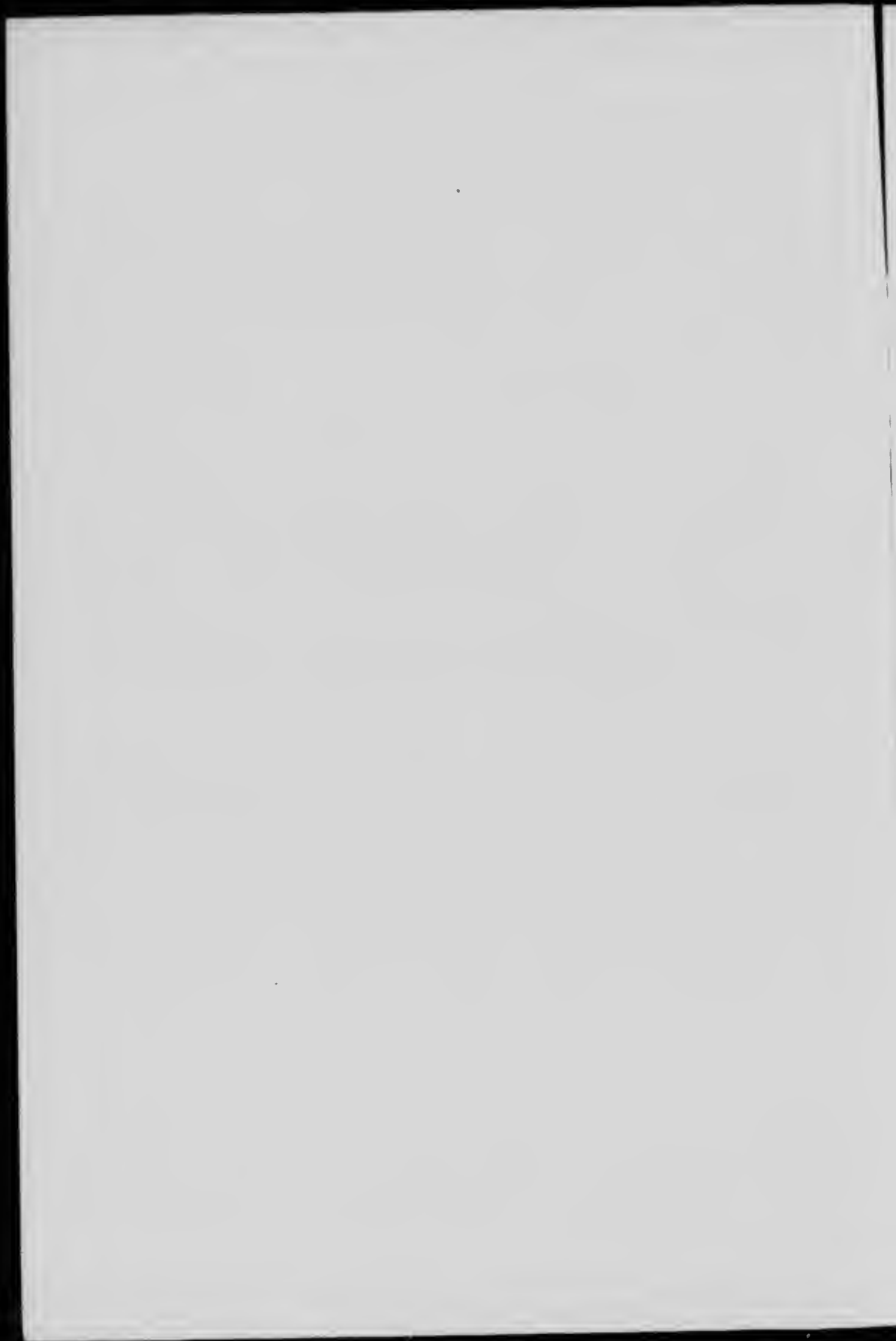
While it is quite possible that the Chinch Bug may never constitute the serious menace to our crops which it does to those of the United States, it is most important that methods of prevention and control be known, and, to this end, the accompanying publication should prove of great value.

I have the honour to be, sir,

Your obedient servant,

J. H. GRISDALE,  
*Director, Dominion Experimental Farms.*

OTTAWA, February 1, 1914.





## THE CHINCH BUG IN ONTARIO.

In 1911 a serious outbreak of the Chinch Bug (*Blissus leucopterus* Say) was reported to the Division of Entomology and, in view of the enormous losses which the presence of this insect in the United States had involved, arrangements were made for an investigation of the outbreak and the life-history of the insect under Canadian conditions with a view to ascertaining whether its presence in the district constituted a cause for apprehension, and what measures could be taken to bring about its control. In a recent circular issued by the Bureau of Entomology of the United States Department of Agriculture it is stated that "few insects have caused such enormous pecuniary losses as has the Chinch Bug. No other insect native to the western hemisphere has spread its devastating hordes over a wider area of country with more fatal effects to the staple grains of North America than has this one." It is estimated that the losses due to its ravages in the United States during the last sixty years considerably exceeded \$350,000,000. Up to the present no very serious losses due to the Chinch Bug have been experienced in Canada. It is not improbable that, in this country, the injuries caused by the insect may never assume the character of those in the United States. Such facts as the long, cold winters, and the late emergence of the single brood of insects in the spring, when it is usually confined to the meadows and pastures, would probably serve as safe checks. In western Ontario, however, where it has been found to be causing considerable injury to the meadows and pastures, and also injurious, to some extent, to adjacent grain and corn crops, it is important that farmers should realize that it is capable of inflicting very serious losses, and that they should be on the lookout accordingly for its appearance with a view to controlling it in the early stages of any outbreak.

This investigation was carried out in 1912 by Mr. H. F. Hudson, Field Officer of the Division of Entomology, who had previously been actively engaged in a systematic campaign of Chinch Bug destruction in Illinois, in 1911, under Dr. S. A. Forbes, the State Entomologist. His previous experience, therefore, was of great assistance in the work, and in the following account which he has written he has taken the liberty of incorporating such control measures with which he was acquainted and which appeared applicable to Canadian conditions.

The Chinch Bug problem in western Ontario is an economic problem, and is directly related to the economic conditions of the district. The shortage of labour has compelled certain farmers to reduce the area under cultivation, and the land has been put under sod. This same shortage of labour will render more difficult the adoption of rotations and such other measures as may be necessary to check the increase of the infested area. It is nevertheless essential that the methods of prevention and control should be adopted wherever the same may be necessary and possible.

C. GORDON HEWITT.

*Dominion Entomologist.*

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# THE CHINCH BUG IN ONTARIO.

BY

H. F. HUDSON, B.S.A., *Field Officer.*

## HISTORY AND DISTRIBUTION.

The Chinch Bug (*Blissus leucopterus* Say) was first noticed in North Carolina in 1783. In the Mississippi valley it has been known since 1823.\* Since 1840, it has been under constant observation in Illinois and other states, where its ravages have amounted to from ten to twenty million dollars in a single season and, throughout its whole range, to a hundred million dollars or more in a single season.

While occasional reports of injury by this insect have been received by the Division of Entomology, Central Experimental Farm, Ottawa, serious outbreaks, so far as I am aware, have not yet occurred within the Dominion. In September, 1908, specimens were sent to the Division of Entomology by Mr. R. Benedict, of Crowland, Ont., with the statement that all the late oats in his district had been destroyed. Writing later, under date of October 5, Mr. Benedict says: "With regard to the Chinch Bug, I may say that the insects did evidently no damage except to late oats, of which, owing to the late season, there was quite a large acreage. The damage was general over the county of Welland." In the fall of 1911, specimens were received from Mr. E. Dunn, of Thorndale, Ont., who stated that they had seriously injured a timothy meadow, and in August, 1913, they were slightly injurious to an oat crop on the farm of Mr. Leitch, three and a half miles southeast of Strathroy, Ont. Early in 1912, Mr. G. E. Sanders, Field Officer of the Division of Entomology, was sent to Thorndale, Ont., to make a brief investigation of the situation. At the time of his visit the bugs were still in their winter quarters hibernating under leaves in woodlots, and under rubbish of all descriptions. As the insect was present over a considerable area of land it was decided to make a fuller investigation and, accordingly, the writer was actively engaged in that work in the infested district during the summer of 1912.

\*23rd Report, S. A. Forbes.

## DESCRIPTION AND LIFE-HISTORY.

The eggs are .03 inch in length, elongate-oval in shape, narrowly rounded at one end and slightly squared at the other, at which end may be seen four small round tubercles. The freshly-deposited egg is whitish and translucent, changing in a few hours to an amber shade, and finally becoming red, as the insect develops within.

The Chinch Bug is dimorphic, occurring in two well-marked forms, one being short-winged, the other long-winged. Both forms are quite common, the greater proportion, however, being of the long-winged type. Except after the final moult, the immature stages, so far as I could ascertain, are identical and could not be distinguished.

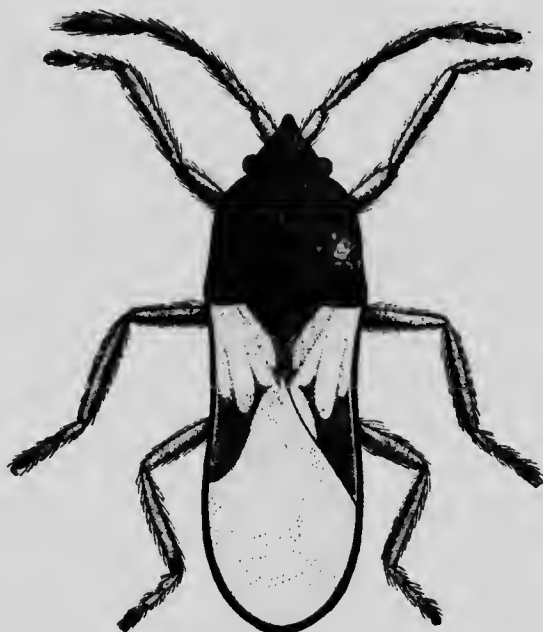


FIG. 1.—Long-winged Form of adult Chinch Bug, *Blissus leucopterus* Say.  
(Original. Enlarged twenty times.)

The newly-hatched larvæ are yellowish-red in colour, with a whitish-yellow band on the three larger abdominal segments. From the second to the third day, the body becomes vermilion in colour, while the pale band across the middle of the body becomes slightly darker. On the sixth day, the head and thorax change to a dusky tint, the abdomen is still of a vermilion colour, the pale transverse band is quite distinct, and two darker lines appear on the prothorax. Very little change, except growth, takes place until the insect is a month old, when the wing pads are plainly evident. As growth continues, these enlarge and the whitish central band becomes more or less obliterated. Soon after this, the final or fourth moult takes place. After shedding its skin the Chinch Bug is of a pale pinkish colour throughout, the wings extending either the whole length of the body, or, in the short-winged form, only one-half the length of the body; they have pinkish veins. After a few hours, two black dots appear on the wing-covers, the head and thorax become darker in colour and finally black.

The adult insect is elongate-oval with broadly rounded ends. It measures about three-twentieths of an inch in length, its width being one-quarter of the length. The head and thorax are black, the entire surface, except the wings, minutely hairy; the

wing covers are white, with a triangular black scutellum between them in front, the whitish area giving it roughly the form of the letter X.

The first winged specimens were obtained on August 11, giving a life-cycle of 54 days. Both forms, short-winged and long-winged, are single-brooded and hibernate as adults. The long-winged form differs from the short-winged type, in that, when most of the former have acquired wings, flights of the adults occur, and these flights were first observed September 5 and succeeding fine days. At the time of my

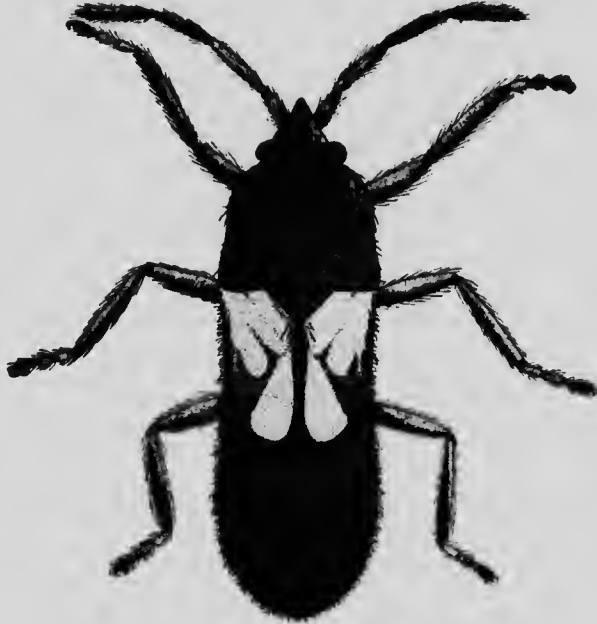


FIG. 2. — Short-winged Form of adult Chinch Bug.  
(Original. Enlarged twenty times).

arrival at Thorndale, May 26, the bugs were then *in coitu*, but I was informed by Mr. Ed. Dunn that he had seen them pairing several days previous to this. Several copulating pairs were taken and put on oat plants growing under glass chimneys, to ascertain the earliest date of oviposition, period of egg laying, and the number of eggs per female usually laid. The first eggs were deposited May 28 and these hatched June 18, the average egg production per female being 95. The period of oviposition was eighteen to nineteen days, but it was noticed that under field conditions the period of oviposition for the whole brood covered a period of six weeks. The number of eggs per female is somewhat fewer in number than are usually produced. Females have been known to produce as many as five hundred eggs, but this must be considered somewhat unusual. Single pairs were put on oat plants which were examined every day for eggs; as the eggs were deposited, they were removed. The largest number of eggs produced per female from six pairs under observation was 117.

#### HABITS.

The female apparently required repeated fertilization. From individual pairs kept under observation, I have seen them copulating on four different occasions, but no record was kept of the time the process occupied. The eggs are usually deposited on the leaf sheath or ligule, but sometimes under ground on the finer roots. The freshly hatched larvae, for about the first week of their existence, feed on the tender roots

below the surface, and usually out of sight. The injury to the plant is caused by the larvæ sucking the sap from the finer tendrils of the roots. It has not been definitely ascertained how long they may feed below the surface, but they may feed in this manner for at least a month, for I have several times taken specimens very delicate in body and colour, with the wing pads partly developed, and on exposure to light they would turn nearly black almost immediately. This, however, must be regarded as exceptional. Should the day be cold and windy the bugs are very sluggish and usually concentrated around the base of the plants; but as soon as the sun shines out the bugs will be seen climbing up and down the stalks and moving in all directions through the field. They seek the higher and drier portions of a field, for a wet location is detrimental to Chinch Bug progress. Hence it is that the poorer condition a field is in, the more liable it is to serious injury, as where plant growth is rank, or the crop in good heart, forming a dense shade, little injury will usually result.

#### FOOD PLANTS.

The principal plants which have suffered are the meadow grasses and particularly is this true of timothy. Wheat, corn and oats have been but very slightly injured, and in no case except where such a field was adjacent to a meadow or pasture. This does not mean that they prefer the meadow grasses to other crops, but that grain crops have been scarce and the succulent nature of the grasses all through the summer had not caused them to migrate to any extent in search of food. Had the season been a dry one, considerably more injury would have been done to the oat and corn crop. So insidious is their work in a field of timothy that the plants may be killed outright without the owner knowing the reason. On corn, the bugs may so cluster around the base of the corn stalks as to prevent the development of the brace roots, which keep the plant upright, and thus in the latter part of the summer many stalks may be levelled to the ground by high winds, and fail to properly mature their ears. Such an instance occurred last year on the farm of Mr. Chas. Hudson, one mile south of Devizes. Adjoining his corn field, of some four acres, was an old timothy meadow. The timothy had been killed outright and, in the latter part of September, the field corn next the infested meadow having failed to develop brace roots, a wind storm levelled the plants to the ground. As mentioned before, all kinds of grasses are subject to injury, and the common grains are also likely to be destroyed, but clover, alfalfa, peas, potatoes, garden vegetables and fruiting plants of all kinds are practically immune.

#### AREA OF INFESTATION.

The infested area covers about five square miles in Middlesex county, embracing altogether some 1,800 acres of hay and pasture land, the greatest injury occurring in the centre of this area. It includes St. Ives, Devizes and Bryanston. The insect has also been reported in the vicinity of Guelph, by Mr. L. Caesar, and also in Nova Scotia by Mr. G. E. Sanders; but in these localities no serious injury was recorded.

It was on what may be termed grass farms, where the greater portion of the land is always in sod, that the most injury was observed; on the other hand, where a regular system of rotation has been followed and land ploughed every three or four years, Chinch Bugs were very scarce, except in such woodland pasture which was deemed inadvisable to cultivate. Under the present system of farming, where pasture is allowed to lie for a number of years, Chinch Bug injury is likely to be on the increase, unless we should be favoured with open winters or wet summers, as heavy rains at hatching time are disastrous to Chinch Bug increase. Such a season as was experienced in 1912 materially reduced their numbers. Wet weather at hatching time was a severe check to undue increase, and this was followed later in the season in September by the appearance of the white fungus, *Sporotrichum globuliferum*, which killed fully 25 per cent of the mature insects.

## RELATION OF WEATHER TO CHINCH BUG INCREASE.

A succession of dry summers, especially during the months of May and June, thus covering the hatching period, is likely to induce an outbreak. On the other hand, a very wet spell at hatching time may be sufficient to overcome a bad attack, but this is not always the case. The rains drive many of the young bugs to the ground, and bury them in the mud, compacting the soil around them and permanently covering them. Wet weather also favours the development of fungous diseases among them.

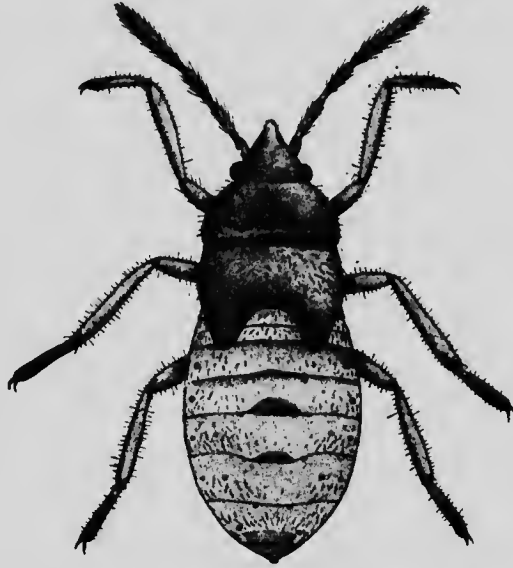


FIG. 3.—Chinch Bug in fourth stage, previous to final moult  
(Original. Enlarged twenty times).

## PREVENTION.

As the Chinch Bug hibernates under rail fences, tree trunks, tufted grasses, and rubbish of all descriptions, *clean farming*, coupled with *regular rotation of crops*, is at once suggested. So far as may be practicable, burn over all waste places; burn all rubbish as late in the fall as possible so as to expose the hibernating insects to the rigours of the winter. To be effective, the burning must be done thoroughly, otherwise little or no good will result. It is necessary to burn right down into the crowns of the grass. As this is usually impracticable on a large scale, and often impossible owing to the weather, the only safe measure is to thoroughly deep plough an infested pasture as late as possible in the fall, being careful to turn under every bit of grass, and plant the ground to a hoed or leguminous crop the following spring. As most of the infested meadows and pastures are adjacent to wood lots in which the greater part of the bugs hibernate, it seems reasonable to believe that if a strip of land, next to the wood lot, was ploughed early in the fall and planted to wheat, it would serve as an excellent bait crop for the bugs coming out of their winter quarters. An inviting food would be at first hand, the eggs would be deposited on the wheat plants, when the whole could be promptly destroyed, including, of course, the bugs, by efficient ploughing and immediately rolling the ground.

## REMEDIES.

*Oiling and Post Holes.*—Should the insects be abundant in a grain field, a strip or swath should be cut around the infested field a week previous to harvesting the crop. If the ground is hard, clear a surface about one foot wide all round the field. An ordinary hoe will be found to be a very suitable tool for the purpose. Then dig post holes twenty-four to thirty inches apart. As soon as cutting commences, a thin line of No. 7 asphalt road oil\* should be poured along the cleared surface. An ordinary water-can with the rose removed will do the work well. A thin line of oil should surround the *outside* edge of the post holes. As harvesting proceeds and the bugs are threatened with starvation, they will commence to migrate from all parts of the field. As soon as they encounter the asphalt barrier, they will cease to move any farther, and they will be forced by sheer weight of numbers into the post holes, where they may be promptly destroyed by pouring in a little kerosene, or kerosene emulsion.

Co-operation between adjacent farmers is absolutely necessary, and if such measures are delayed, the young migrating bugs will have developed wings, and the barrier of course will be useless.

*Dusty Furrow.*—Should the weather be very dry and hot, the dusty furrow may be used to good advantage. A strip of land six to eight feet wide should be deeply ploughed next to the infested field. The ground should be thoroughly pulverized with a disc harrow until it is reduced to dust. Then a weighted log six to eight feet long, sharpened at one end, should be drawn lengthwise, back and forth until a deep furrow has been made across the line of the Chinch Bug path. The dusty sides will prove impassable to the bugs, and if it is so placed that it is directly exposed to the sun, the majority of the bugs will sneeze. Should a rain come, and the dusty furrow cannot be renewed, a thin line of asphalt road oil may be poured along the bottom of the furrow, post holes, as described before, having been dug previous to this. Should the bugs have acquired wings, and entered an adjoining corn field, the corn should be sprayed with either nicotine solution, or a ten per cent. kerosene emulsion. The nicotine solution is preferable, and should be used wherever possible. The formula and method of making the nicotine is as follows:—

Soap, 2 ounces.

Water, 1 gallon.

“Black Leaf 40,”  $\frac{1}{2}$  ounce (40 per cent. nicotine). (See Note 2, page 13.)

Heat the water nearly to the boiling point, thoroughly dissolving the soap, and then add the nicotine solution. If soft water can be obtained, use slightly less soap. As with all sucking insects, thoroughness in spraying is absolutely necessary. An ordinary ten per cent. kerosene emulsion can be used with good results, but unless the plants are vigorous it is not advisable to use this substance. Should the kerosene emulsion be used, a little caution is necessary. Do not pour the solution into the heart of the plant, and spray preferably early in the morning or late in the afternoon, otherwise there is a danger of the foliage being burned. The nicotine solution is so much more efficient and the danger of plant injury so slight that, where it is possible, this substance should be used in preference to all others.

## NATURAL CONTROL.

Unlike most of our other insect pests which, for a time, seem to gain the mastery of a tract of country, the Chinch Bug enjoys almost practical immunity from attack by birds, and appears to be attacked by few insect parasites. Very few of our insectivorous birds are known to feed upon the Chinch Bug to any extent; the quail probably feeds upon this bug to a larger extent than any other bird, but, as in the case of many of our beneficial insectivorous birds, it does not receive the measure of protection it justly deserves.

\* See Note 1, page 13.



## FUNGOUS DISEASES OF THE CHINCH BUG.

The chief means of natural control of Chinch Bugs are several fungous diseases, but the only one that has been found in Canada is the well-known Chinch Bug fungus, *Sporotrichum globuliferum*. Believing that some good results might be accomplished by the artificial dissemination of the fungus, a pure culture of the fungus was secured from Prof. Glenn, of the University of Illinois. A number of healthy bugs were collected in suitable tight boxes, two feet long, one foot wide, and fourteen inches high. Into these boxes, soil direct from the field was introduced. In one box spores of the fungus were introduced and thoroughly mixed with the soil, while another box was used as a check experiment, no spores being introduced. It must be borne in mind that neither soil nor boxes were sterilized. Fresh food was introduced as often as necessary. In the infested box, the first diseased specimens appeared six days after introduction, seven specimens being found, all mature and probably "spent" bugs. No other specimens were obtained until fourteen days after, when sixteen specimens were found to be diseased. The experiment was carried on for one month, with no other appearance of diseased bugs. In the uninfested box not one diseased specimen was taken. No reliance, however, should be placed on this experiment, as in the latter part of September, following a cool and wet spell, I was surprised to find the fungus abundant in every field visited. After making a careful survey of several fields, I estimated that fully twenty-five per cent. of the insects had succumbed to this cause. I had attempted to reproduce this fungus artificially in the latter part of May, and the failure of the experiment must be put down to unsuitable weather conditions, for, as shown above, the fungus was naturally abundant in the soil. Inasmuch as this fungus is dependent upon suitable meteorological conditions for its growth, it is sufficient to place it in a second or third place as a suitable remedy for Chinch Bug extinction. Some very careful and extensive work along this line has been carried out in Kansas by Messrs. Billings & Glenn, and I quote below part of a summary of their work: "The fungus shows little tendency to spread from centres of artificial infection. The apparent rapid spread of the fungus is due to favourable conditions bringing it into activity simultaneously over considerable stretches of territory. In fields where the fungus is not in evidence, spores introduced artificially have no measurable effect. Apparent absence of fungus among Chinch Bugs in a field is evidence of unfavourable conditions, rather than a lack of fungus spores. Advocating artificial infection or encouraging it by sending out diseased bugs does not serve the best interests of the farmer, since his attention is thus diverted from other and more efficient methods of combating the pests."

### NOTES.

1. The asphalt road oil previously mentioned can be obtained from the Standard Oil Company, Whiting, Illinois, and it is particularly important to state that No. 7 grade is required.

2. The nicotine solution, commonly known as "Black Leaf 40," can be obtained from the Kentucky Products Co., Kentucky, U.S.A. The price is \$12.50 per gallon, exclusive of the express charges.

