MONTANA AGRICULTURAL COLLEGE
EXPERIMENT STATION.
F. B. LINFIELD, Director.

BULLETIN NO. 71

FIFTH ANNUAL REPORT

OF THE

State Entomologist of Montana

BY
R. A. COOLEY,

BOZEMAN, MONTANA
FEBRUARY, 1908

Montana Agricultural College Experiment Station.

BOZEMAN, MONTANA.

Post Office, Express and Freight Station, Bozeman.
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THE MONTANA EXPERIMENT STATION,
Bozeman, Montana

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LETTER OF TRANSMITTAL.

Bozeman, Montana, February 1, 1908.

To His Excellency,
Governor Joseph K. Toole,
Helena, Montana.

My dear Sir:—

I have the honor to transmit herewith the Fifth Annual Report of the State Entomologist of Montana, which will appear as Bulletin No. 71 of the regular series of the Experiment Station.

With much respect,

R. A. Cooley.

FINANCIAL STATEMENT.

1907.

April, 5, expense of a trip to Great Falls, March 28-30.....$25.65
" 22, expense of a trip to Belgrade, April 13..... 5.10
June 15, office expense items:
Labor, W . King 4.83
Lumber, Kenyon-Noble Lumber Co. ..... .35
Livery, W. J. Fransham 4.00
Supplies, W. B. Bessey 2.50
Supplies, S. G. Phillips, ... 2.00
Labor, Wm. T. LeFevre, ... 6.80
Supplies, Benepe-Owenhouse Co., ... 1.00
Furniture, D. D. Smith, ... 10.50
Supplies, Draper Manufacturing Co., ... 3.26
Labor, F. W. Sabransky 6.25
Typewriting, Lillian Nord 10.80
Photographic supplies, Westfall-Casey Co..... 8.00
June 15, expense of trip to Missoula, Hamilton, etc., May 26-31 ..... 44.75
July 8, expense of trip to Billings, July 3-6..... 23.93
July 8, expense of Willard King's trip to Billings and Joliet, June 12-16 ..... 24.50
July 8, office expense items:
Labor, Edgar Allen 35.00
Supplies, Flint-Lynn Lumber Co., ... 3.95
Supplies, W. B. Bessey, ... 3.00
Supplies, W. B. Bessey, ... 2.35
Supplies, H. B. McCay, ... 5.10
Supplies, Spencer Lens Co., ... 2.10
Insect specimens, F. H. Snow, ... 13.20
Supplies, American Entomologicl Co. 10.40
One cut, Standard Pub. Co. 2.00
July 8, Prof. D. B. Swingle, expense of trip to Billings and Joliet, June 12-16 ..... 34.50
Prof. Swingle, livery, W. J. Fransham..... 4.00
Aug. 16, expense of trip to Missoula and Hamilton, July 8-10. 39.95
Aug. 21, Prof. Swingle, triip to Flathead county, July 21-27... 59.75

Aug. 21, Prof. Swingle, trip to Missoula and Hamilton, July 8-13	45.75
Sept. 16, Prof. Swingle, trip to Missoula	32.85
Sept. 16, E. W. Allen, trip to Billings and Wilsey, Sept. 2-7	21.35
Total	$499.67
Unexpended balance	.33
Amount of appropriation	$500.00

FIFTH REPORT

OF THE

STATE ENTOMOLOGIST OF MONTANA.

The present report discusses the principal entomological features of the year 1907 in Montana, but gives particular prominence to the army cutworm by treating of it under a separate section. The year was one of about an average prevalence of pests, and was rich in results of a technical nature that will be published elsewhere.

During the coming year we shall conduct investigations on the sugar beet insects, continuing the studies already begun, and we shall make a study of the oystershell bark louse, a pest that is abundant and injurious in the west end of the state.

At the suggestion of the State Board of Health, we have undertaken to study the life history in nature of the common wood tick and intend to give particular attention to its host relationships. This study is being taken up on account of the connection of this arachnid with the Rocky Mountain spotted fever disease, as shown by the work of Dr. H. T. Ricketts of the University of Chicago. The amount of work we do on this tick will depend upon the funds we are able to get. Unless we are able to secure a special fund for this purpose we will be obliged to do only a small amount of work, for the investigations are of such a nature that they do not fit in well with our studies of the habits of the pests of crops. The work on the tick must be done principally in the mountains where the ticks are and where the host animals live, while the work on insect pests can be done largely at our insectary at the college.

AN ARMY CUTWORM.

Chorizagrotis auxiliaris.

On page thirty-nine of the Fourth Annual Report of the State Entomologist the occurrence of an undetermined cutworm is discussed. Specimens of this insect in the larval stage had been sent to this office under date of October 25, 1906, by T. S. Stiles, R. F. D. No. 1, Belgrade, with the statement that they were doing a great deal of damage. Specimens continued to come in from other farmers until the very last of November. Larvae were fed in the greenhouse of the biology department and brought to maturity, and it was found then that they belonged to *Chorizagrotis auxiliaris*, a species that has been very abundant and injurious in Colorado, and a very close relative or possibly identical with the army cutworm that became so abundant and very injurious locally in the Bitter Root valley in the spring of 1898.

The species that ravaged in the Bitter Root valley was determined to be *Chorizagrotis agrestis* and there seems to be some reason to believe that *C. agrestis* and *C. auxiliaris* are one and the same species and identical also with *C. introferens*. If all are shown to belong to one species it will be clear that our recent outbreak in and around the Gallatin valley is chargeable to the same insect that operated in the Bitter Root valley in 1898, and that facts secured about this insect and this outbreak will but add to the history of that insect.

It was most fortunate that there was sufficient moisture, after the caterpillars ceased eating and went into the ground, to make it possible to sprout a second seeding and grow a good crop. If there had been an average, or less than average, precipitation, it probably would have been impossible to secure a good crop. Below is given the amount of precipitation, in inches, for the months of May, June and July as shown by the records preserved by Prof. Burke of this Experiment Station:

	May	June	July
1902	3.90	2.60	.87
1903	2.58	2.45	2.76
1904	2.02	1.78	1.11
1905	3.23	2.62	.74
1906	2.34	3.39	.49
1907	3.16	4.78	2.46

It will be seen that in May, June and July of 1907 there was an unusual amount of rainfall. This, of course, favored the production of a good crop under the adverse conditions.

The Experiment Station will continue, for a time, the study of the insect that caused the outbreak in the Gallatin valley and it is hoped that we shall learn more about its life history, habits and natural enemies. It is hoped, further, that we may determine whether or not the three named species of the genus *Chorizagrotis* are all one.

OCCURRENCE IN OTHER PARTS OF THE STATE

The larval characters of these species have not been worked out and compared with each other, and with other closely related forms, but a careful examination of the various lots that were sent in to us, from widely different parts of the state, lead us to the conclusion that this was practically the only species of cutworm that caused much damage to crops in the state of Montana in the summer of 1907, and that this species was very widely and abundantly distributed. We received complaints from several people near Great Falls, and while in that city made an examination in gardens and found this species plentiful and no other one present. With the exception of two other species of cutworms which we found very sparingly around Bozeman, the army cutworm was the only one that we saw during the summer in our walks in town and in the fields outside of town. This species we saw very frequently.

RETURNS FROM QUESTIONS ASKED OF FARMERS

For the purpose of obtaining actual knowledge of the extent and conditions of the outbreak in the Gallatin valley, a series of questions was prepared and sent early in May to such addresses as we were able to get of those whose fields were infested. Replies were prompt and willing.

1. How many acres have you infested with army cutworms?

To our certain knowledge there were very many whose addresses we did not have and the questions were sent only to the addresses in the Gallatin valley as we had made no study of the conditions in the more or less scattering districts in other parts of the state. Therefore, the figures here given represent only a small part

of the area infested in the state. These figures are of interest, however, as they show the extent of area concerned in the other answers that follow. The actual area here reported upon is four thousand, five hundred and sixty-two acres.

2. How many acres completely destroyed so that re-seeding seems to be desirable?

Two thousand, six hundred and ten acres were reported. We know, however, that much more than this was destroyed.

3. Name the kinds of crops affected and acreage of each.

Very little was reported excepting wheat. One reported alfalfa.

4. When were your affected fields ploughed?

Some replied, May; some, June; a majority replied May and June while a few did not finish until early in July. From the reports it is apparent that the greater part of the ploughing was completed by June 20.

As stated elsewhere in these notes the army cutworm was injurious chiefly on summer fallow land or land above the ditch. Under the practices of dry land farming in the Gallatin valley it is therefore to be expected that the ploughing should be done in May or June. In sending out the list of questions it was not apparent whether the persons whose names we had were above or below ditches.

5. What was the previous condition of each field? (Whether in summer fallow, never ploughed before, clover etc.)

Almost without exception the affected fields had been in grain the year before and were stubble, ploughed under in the spring. A little virgin sod was reported and a little "second sod."

6. If the field was in summer fallow, was it free of weeds, volunteer grain, or other vegetation during the latter part of the summer and during the fall?

About one-half of those addressed reported their fields to be free or practically free of weeds or other vegetation. Nearly one-half reported some weeds or volunteer grain and a very few reported many weeds or much grain. Large fields reported free of all vegetation or practically so were also reported as completely eaten off. We had previously felt that probably the presence of the army cutworms in the fields could be traced to volunteer grain or weeds in the same fields the summer or fall before. In the light of the fairly abundant evidence produced in these replies we are left in doubt as to the ex-

planation of the presence of these cutworms in the central portions of large fields. It is well known that the moths do not deposit their eggs on the bare soil. Only two possible explanations seem to be left, namely, that the young caterpillars hatched in the edges of the fields and crawled in, or that the eggs were laid on the young grain in the fall. From dated specimens in our collections at the experiment Station, while not probable, it seems possible that eggs of this species might be laid in abundance as late in the fall as the grain was up and grown to sufficent size for the moths to lay their eggs on it.

7. Did you notice an unusual number of moths or "millers" about your house or in the grain field during or about September?

Nearly all answered, no.

8. Do you irrigate?

All answered that they do not irrigate grain fields. To our certain knowledge, however, other fields not covered in these replies were more or less affected with the army cutworms.

SEASONAL HISTORY

In the fall of 1906 the caterpillars, while very uneven in size, grew to be about half an inch in length on an average. Warm, growing weather continued until unusually late that season and the caterpillars were so numerous, and, on account of the warm weather, continued to feed so long, that a good deal of grain was eaten. While, generally, cutworms do not make their presence known until spring, in this instance it was known during the fall all through the infected region that the cutworms were there and that damage might be done. When cold weather set in, the caterpillars ceased to feed and remained dormant until the spring. Anxious farmers went out in the winter and dug up specimens from under the snow and, on taking them into a warm room, found them to be as lively as ever. With the first starting of vegetation in the early spring the caterpillars were again active and feeding. It would be difficult to state on just what date they began to feed. On southern exposures and in warmer spots the vegetation would naturally start earlier and, correspondingly, the cutworms would be active earlier. On the occasion of a visit to the infested wheat fields on the foothills north of Belgrade on April 13, a quantity of the larvae were brought back to the insectary to be reared to the adult stage. On that date none were to

be found that were approaching full size, but on April 26 the largest were nearly full grown and measured 50 mm., or about two inches in length. The specimens brought in fairly represented the range of sizes to be found in the field.

The most advanced specimens went into the earth to pupate very close to May 1, and on the 15th all had disappeared. The first pupae were found in the earthen cells on May 6. Around May 15 we heard from various quarters that the cutworms were disappearing and that no further damage was being done. However, we were able to find a few caterpillars as late as the first week of July.

We were unable to secure eggs from the moths that emerged and have no record of when the second brood of cutworms appeared, if there was a second brood. The species certainly was not injurious in the fall of 1907. We believe that for some unaccountable reason the female moths were not able to lay eggs, except in small numbers, and that this explains the disappearance of the insect in the role of a pest. We do not, however, believe that the insect has wholly disappeared. We will probably be able to capture a few specimens next summer.

We are likewise unable to explain why the species came in such unusual numbers. The same phenomenon is happening again and again with other pests but the cause has not yet been explained.

From the records we have secured as here given it is apparent that if there is a second brood of the insect in Montana, as it is believed there is in Colorado, it must pass through all of its transformations betwen early in August and not later than the middle of October. That this can occur does not seem probable for the larval stage required at least six weeks and at least nine weeks were spent in the earth preparing to pupate and in the pupal stage.

Moreover, it will be remembered that by October 25, when Mr. T. S. Stiles sent specimens to the Experiment Station, the brood of caterpillars had reached sufficient numbers and size to attract attention. Farmers were much alarmed at this time. It is reasonable to suppose that the caterpillars had been feeding at least ten days, and the eggs were probably laid not much later than October 1. It is not improbable, therefore, that the moths might have emerged from the pupal stage as early as September at least. It seems, then, more likely that there is but one brood of this insect in Montana.

LIFE HISTORY AND DESCRIPTIONS

THE EGGS

The egg, when first laid, is white in color, but before hatching it becomes brown. The eggs are attached to grass and other vegetation and hatch in a very few days after being laid. (Gillette, Bulletin 94, Colorado Experiment Station.)

The eggs for the brood of caterpillars that proved so destructive were probably laid late in September. We cannot give exact information on this point as we were unable to secure eggs from the stock of moths we had. We do not know the duration of the egg stage.

THE YOUNG WORMS

The young cutworms are very small and are very dark colored. They secrete themselves in the stools of wheat and the close-by earth but do not avoid the light as noticeably as when larger. They crawl with a looping motion, thus resembling the measuring worms.

HIBERNATION

The caterpillars do not hibernate at any particular size or age but in general are about half grown when cold weather sets in and causes them to become dormant and enter the period of hibernation. They hibernate from two to three inches under the surface, though we were informel by farmers that great numbers of them could be found just between the snow and soil.

THE AWAKENING IN THE SPRING

As the warm spring days come on the cutworms become active but a cold storm, such as we often have in our climate at this season of the year, causes them again to become quiescent for a time, only to become active again with the return of higher temperature. Thus they begin to be active very early in the spring and by the time the vegetation has made an appreciable growth the cutworms have increased in size. They eat ravenously at this season of the year and grow very rapidly and, as green vegetation is more scarce at this time, the effects of the presence of the cutworms become very noticeable. Their presence is particularly noticeable if the field has been ploughed in the spring and the vegetation on which

the insects were feeding in the fall is removed and the field is set with plants. The hungry caterpillars searching about for food, make short work of such crops as cabbages, beans, sugar beets, etc. In a few instances we have known a sugar beet field completely eaten off by this species so that it was necessary to plant the ground to another crop that could be matured before the end of the season. At Miles City our attention was called to a small field planted with onion sets. The onions had made a good start when the cutworm attacked them and completely ate off the tops and followed them down inside and ate out the entire bulbs, except the dry outer walls. Scarcely an onion was left.

The cutworms molt from time to time but their appearance does not change materially as they grow larger, though the prevailing color-cast is much lighter in the older stages. The individual caterpillars vary considerably in depth of color.

RANGE OF FOOD.

The caterpillars eat a very wide range of plants and have not refused to eat any kind of food placed in their cages. In grain fields they show a distinct preference for the grain, paying little attention to the various weeds to be found there in abundance. The succulent tops of beets they eat readily. A bulletin of the Colorado Experiment Station, by Mr. S. Arthur Johnson (Bull. 98, p. 17) records that in 1903, near Denver, they ate an entire field of alfalfa. Ordinary lawn grass (blue grass) is eaten readily and we brought to full size a large number of the caterpillars in our greenhouse in the winter of 1906-7 by placing in their cages pieces of green lawn sod from over steam pipes passing from one building to another. They are a general garden pest and we do not consider that any crops, with a possible few exceptions, are exempt from them. Profesor E. V. Wilcox recorded the following plants as being eaten by *Chorizagrotis auxiliaris*: "Clover, lupine, alfalfa, sanfoin, cabbage, horse radish, radish, mustard, turnips, shepherd's purse, timothy, bluejoint, red-top, wheat, oats, rye, barley, thistle, *Balsamorrhiza*, cactus, beets, strawberry, cherry, apple, peach, apricot, prune, plum, raspberry, currant, gooseberry, blackberry corn, peas, celery, tomato, onion, avens, larkspur, rhubarb, dandelion, and numerous other native grasses."

DETAILED DESCRIPTION OF THE LARVA.

Head with ground color sordid white with a yellowish tinge; with dark brown markings as follows: a dark line in a transverse depression on lower side of clypeus directly above which is a row of dots marking the positions of setae; dots on the sides of the head, behind and above, grouped and confluent, leaving open spaces; a subquadrate patch on each side of the clypeus following the converging sutures, not joining above but diverging again, more or less narrowed as they pass backward; a spot just back of the ocelli. Antennae translucent, whitish with terminal joint brown. Mandibles tipped with black. **Body** with prevailing cast distinctly dark above. A sordid white, more or less broken dorsal line extending from the head to the anal shield with marked subdorsal lines of yellowish brown, which, with the dorsal line, give the appearance of a well marked broad stripe down the dorsum; an indistinct sordid white lateral line; the entire venter, from stigmata down, pale translucent brownish, finely mottled with sordid white. Sparsely but regularly scattered over the body are glossy spots or low tubercles, each bearing a fine short hair. Under the naked eye the hairs are scarcely visible. Length, 28 mm. As the caterpillars increase in size but little change of general appearance is to be noted. The largest specimens, when full fed, measure 55 mm. in length.

PUPATION

When full grown the larva constructs a vertical oval cell in the soil about two or three inches below the surface, using its head as a spatula, smoothing the walls and giving them a regular shape. After remaining in this sell for about six days the skin is molted off and the insect appeas in the pupa state. The pupa is brown in color, much shorter than the caterpiller, and the head end is pointed upward. In our experience as given in the seasonal history above, the duration of the pupa stage is about eight weeks, or about nine weeks including tthe six days of preparation for pupation.

THE ADULT MOTH

(See figure accompanying.) Detailed descriptions of the three species mentioned in this paper are given elsewhre in technical lit-

erature and we therefore offer here only a brief outline description to accompany the figures of the moth made from our photographs. With the wings expanded as shown in the figure the measurement from tip to tip is one and three-fourths inches. The general ground color is brownish. The front wings have more or less distinct markings of lighter brown or, rarely, of gray, making patterns as shown in the figure. The posterior or under wings are distinctly lighter, especially toward their bases, and the veins show through with fair distinctness.

Army Cutworm Moths, showing variation in pattern of markings. About natural size.

When at rest the wings are folded back over the body, leaving only the fore wings visible. They fly to lights and in Colorado have been known to be very numerous at the windows of houses. During the daylight hours they hide in secluded nooks and corners around clods of earth, boards, fences, dead weeds, etc., and if disturbed dart off in an irregular course.

ENEMIES AND PARASITES.

BIRDS

In some measure the natural enemies of this highly injurious species hold it in check but, as given below, we do not consider them to be the cause for the sudden disappearance of this insect after one year of presence in injurious numbers. Among birds, blackbirds, meadow larks, bluebirds, quail and blue jays have been recorded from Colorado. Professor Wilcox found the blackbird, robin, crow and meadow lark eating the cutworms As would be expected, domestic fowls have learned to eat them also. In this valley we found blackbirds feeding freely on them and bluebirds sparingly.

INSECT PARASITES

Professor Gillette, of the Colorado Experiment Station, has recorded two large ichneumon flies as parasitic on *Chorizagrotis auxiliaris*, namely, *Amblyteles subrufus* and *Ichneumon longulus*. He also reports having bred one to two thousand specimens of *Copidosoma*, a genus of the family *Chalcididae*.

Professor Wilcox found several beetles atacking the larvae of *C. agrestis*, among them being *Harpalus* and *Calosoma*. In the infested fields in the Gallatin valley last season we found specimens of *Calosoma* (species undetermined) feeding on the larvae but not in such numbers as to make much impression on the pest. The most abundant parasite, in our experience with this cutworm, was a Tachinid fly, which we have tenatively determined as *Pelcteria tessellata*. About five per cent of the caterpillars were infected with the maggots of this species of parasite.

WILL THIS INSECT AGAIN BE INJURIOUS?

Farmers have repeatedly asked what became of these insects and what we may expect in the future regarding them. We have been unable to find anyone who has seen any of the caterpillars since the destructive brood of the spring of 1907 disappeared from sight.

The immediate disappearance of the species is easily explained. When fully fed the cutworms went into the soil to pupate. Such of

them as did not die from parasites or other causes while in the ground, later came out in the adult or moth stage.

Why they did not reappear in great numbers as larvae is not plain. From our experience with the outbreak, we consider it impossible that the parasites and predacious enemies are responsible for the reduction of the species. As has already been indicated, the moths which we reared from the larvae, that we fed to full size, were unable to lay eggs, and we think it quite possible that this fact accounts for the failure of the insect to reappear in noticeable numbers, but we feel sure that some individuals in the open field would be able to reproduce and that a careful search would reveal a few specimens at any time. It is entirely possible that the species may again become injurious, but it is not likely that in very many years the same species will again be injurious in the same locality. This insect is present throughout the state and has been present for many years and the next time it becomes noticeably abundant it may be in some remote spot.

NOTICEABLE INSECTS OF THE YEAR 1907.

THE EYE-SPOTTED BUD-MOTH

(*Tmetocera ocellana* Schrif.)

This insect appears to be rapidly spreading in the Bitter Root valley, and we believe it to be practically universal from Missoula and the surrounding country to Hamilton. We have recently found it at various points between these two extremes. It is a pest that at times becomes quite injurious, but from our experience with it and from our experiments in Missoula in the summer of 1904, we believe that it will be controlled incidentally in connection with spraying for the codling moth and we believe that the practice of spraying for this insect will soon be general.

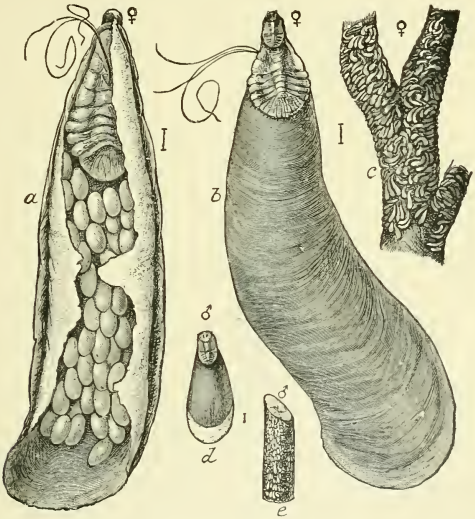
The bud-moth feeds in the spring of the year in the opening buds of the apple, eating out the tender shoots and producing abnormal branching, besides destroying the prospects for a crop of fruit. Later in the season the young larvae of the new brood feed from the surfaces of the leaves, and it is at this time that the species is most open to control.

THE OYSTER-SHELL BARK-LOUSE

(*Lepidosaphes ulmi* Linn.)

This insect, generally looked upon as being one of only second class importance by fruit growers and entomologists of the United States, has been found to be very prolific and injurious in western Montana. The species has held our attention for several years and has been gradually spreading and increasingly we have received complaints from owners of orchards in the Bitter Root valley, the country along the line of the Northern Pacific railway west of Missoula and from Flathead county. In a few cases the writer has seen small orchards which at a distance of about half a mile plainly showed a sickly condition. In many cases the fruit on infested trees has been seriously injured by reason of the great numbers of the scale insects settling on them and causing spots and pits. We have recommended spraying with kerosene emulsion at the time the young lice are hatching and crawling about on the bark, but our growers are afraid of this insecticide and believe that trees were injured by its use. So persistent and widespread is this belief that we have decided to make

a study of the action of this emulsion on the tissues of the apple tree. We have further decided to make a study of the habits of this scale insect, particularly at the time of hatching and starting the young scales in June. This work will be undertaken in the season of 1908.



Oyster-shell Bark-louse: a, female scale from below showing eggs; b, same from above, greatly enlarged; c, female scales; d, male scales, natural size. (Howard, Year book, U. S. Dep't of Agr.)

THE SPOTTED BLISTER BEETLE

(*Epicauta maculata* Say.)

This is one of the insects most frequently sent to the Experiment Station during recent years. As its name indicates it belongs to the order of beetles or Coleoptera and is a member of the family of "blister beetles" or *Meloidae*, which are remarkable and interesting from the fact that in the early development more stages are passed through than is usual for insects. They are called blister beetles because of the fact that they are used in making blistering salve and

blister plasters. The blistering material is prepared by killing the beetles and allowing their bodies to dry, when they are ground to a fine powder. The European species used for this purpose is known as the Spanish fly, but our American species possess this same quality.

Our collections contain at least sixteen species of *Meloidae* from Montana but the spotted blister beetle is by far the most injurious one. It is particularly abundant in the eastern part of the state Not much has been published regarding this species, though the habits in general of the genus *Epicanta* are fairly well known. Some of the species are known to feed in their early stages on the eggs of grasshoppers and it is likely that this species does so also.

The spotted blister beetle has the general appearance of all

The Spotted Blister-Beetle—nearly three times natural size (Chittenden Division of Entomology, U. S. Department of Agriculture.)

beetles, and has an elongated body, three pairs of rather long legs, a pair of thread-like antennae. The body has a distinct gray cast, due to the fine gray hairs, but regularly arranged spots appear where the hairs are absent and the black body wall shows through. The beetles vary greatly in size, the smallest being a little over one-fourth of an inch in length and the largest, upward of a half inch long.

The spotted blister beetle feeds on a variety of plants and is partial to sugar beets, garden beets and alfalfa. It sometimes appears in enormous numbers in alfalfa fields and does considerable damage. Frequently they are more or less injurious to sugar beets, sometimes eating off large patches in fields about the time of thin-

ning. They appear to be more abundant in upland regioins rather than in the lower river valleys and in such localities often congregate in great numbers from surrounding untilled lands.

In the eastern states another species, *Epicanta vittata*, is known as the "old fashioned potato bug," but so far as we know this species does not occur in Montana, though the farmers are in the habit here of speaking of a species by the above common name used in the east, What this species is is not clear to the writer, but we think it probably either *Macrobasis unicolor* or *Cantharis sphaericollis*.

The beetles succumb readily to arsenic poisons, such as Paris green, and under circumstances where the field is not too large the use of this insecticide is advised. It is not clear whether its use should be advised on alfalfa, and for the present it is best to be on the safe side. In alfalfa fields these beetles would probably leave at once if the alfalfa were to be cut for hay and where the insects are very abundant it may be best to cut a few days ahead of the regular time.

THE CODLING MOTH

(*Cydia pomonella.*)

The codling moth continues to be the insect pest most to be feared by growers of apples, not because of the damage it has done or is doing, but because of what it is capable of doing in commercial orchards.

Little change is made in the situation as regards this pest in a single year, but during the past few years a considerable number of new colonies have been located, and the older established colonies have continued with no improvement.

This insect is here to stay and it is highly desirable that the fruit growers prepare to wage a war upon it. We are pleased to note that our fruit growers are awake to the importance of prompt action and are willing to buy the necessary spraying equipment.

The codling moth is now present in about eighteen separate localities in Montana and extermination is out of the question.

We are entering upon a very critical period in the apple industry in this state and unless greater unanimity is shown with regard to the control of the codling moth than is being shown in the packing

of apples in fruit growers associations, Montana's reputation for clean apples will be irrevocably lost. It is physically impossible for the Board of Horticulture to spray all of the infested orchards at the proper time, and the work cannot be left to them with any hope of success. The apple growers themselves should not only take an interest in this matter, but should actually do the work of spraying for themselves. It should be sufficient for this Board to instruct in spraying and indicate where spraying is necessary. The individual owners should own spraying outfits and spray their trees as directed.