

# REPORTS ON INJURIOUS INSECTS.

HERBERT OSBORN.

H. A. GOSSARD.

## ATTACKS OF THE INDIAN CETONIA ON CORN.

A short time since Prof. Curtiss informed us that Mr. Dana Reed, of Coon Rapids, had given him some beetles that were eating into the ears of corn, and from his description it was inferred that they were the common Indian Cetonia (*Euphoria inda*), which has in a few instances heretofore been reported as doing damage of this character. The beetles proved, as suspected, to be this species, and in view of the uncertainty as to the possibility of this species to do damage of this kind it seemed desirable to get as much data as possible and to make some tests of its ability to enter uninjured ears.



FIG. 1.  
*Euphoria inda.*

The cases hitherto recorded where *Euphoria inda* has attacked corn, eating into the ears, may be summed up as follows, most of the information on the subject, so far as we have noticed, being contained in the first Report on the Insects of New York by Prof. J. A. Lintner.

In the Fourth Annual Report of the State Entomologist of Ill., Dr. LeBaron says: "It is sometimes troublesome by burrowing into ripe fruit, and also by feeding upon sweet corn in the milk." Prof. Lintner states also that Dr. Harris states that about the middle of September it may be found in great numbers on corn stalks feeding upon the sweet sap."

In 1878 it was reported from many places in New York and New England as attacking corn, and it was following this attack that it was treated in detail by Prof. Lintner in his First Annual Report. His conclusion however was that its injury to corn followed the injury of some other depredator, and especially the English Sparrow, and that it was due to the exceptional numbers of the insect that particular year, and that there was no probability of the injury occurring in a similar degree in following years. He also quotes the Entomologist of the Department of Agriculture as follows:

“One of the commonest flower beetles, *Euryomia inda*, has been received from several correspondents as attacking green corn,—a habit which the species was not before known to possess and which has, beyond much doubt, been recently acquired.”

We also wrote to Mr. Reed, at Coon Rapids, for all the data possible regarding the amount of injury, whether any was caused after the corn hardened, and whether he could be sure that the beetles attacked ears that had not been injured in any way by birds or insects of other kinds.

To this we received the following reply:

COON RAPIDS, Ia., Oct. 1, 1891.

*Prof. Herbert Osborn.*

DEAR SIR:—Yours of Sept. 26th is before me. In reply will say that the beetles injured about two acres of corn or about fifteen or twenty rows on the outside of the field and adjoining clover and timothy pasture. They work on the silk first, then go down the ear as fast as they desire food. They usually eat from one-fourth to two-thirds of the ear which they attack. They leave the corn as fast as it gets beyond danger of frost. They attack ears that are uninjured by birds or by other insects.

Yours with much respect,

DANA REED.

Our own experiments were directed to determining whether the beetles confined upon corn ears would eat those having no previous injury, and noting injury on ears more or less opened previous to the confinement of beetles upon them.

The beetles were found in abundance, especially upon *Ambrosia trifida* the ripening seed of which seems to possess some very attractive quality for them.

The beetles in lots of ten were at first confined upon ears of corn in cheese cloth sacks, but they invariably escaped through its meshes, and our results were therefore entirely negative with the first trials. The beetles were next confined in strong muslin bags. September 29th, seventeen beetles were confined upon an ear in the milk from which the husks were stripped down. October 2d, one of the beetles had escaped and the corn had been eaten to the cob. On the same date, in a different sack, eight beetles were confined upon an ear having the husks stripped back and the soft corn

bruised. October 2d, none of the beetles had escaped and the corn was much eaten.

October 2d, fourteen of the beetles which had been confined for the preceding experiments were enclosed upon an ear from which the husks had been stripped back and then carefully closed down in natural position. October 5th, the beetles all remained and had opened up the husks and were eating the corn.

Also on October 2d, eight beetles were enclosed upon an ear, the husks of which were slightly loose at the end. October 5th, the ear remained untouched. October 7th, one of the beetles had eaten a tunnel through the silk and was feeding on the corn. Other beetles were entering the tunnel.

October 5th, fourteen beetles were enclosed upon an ear that was not opened, and the husks of which were unusually tight, and extended about one and one-half inches beyond the end of the ear, encasing the silk. October 7th, seven of the beetles remained and one had burrowed through the silk, eating into it as it went and had commenced feeding on the corn.

The same day, the remaining seven beetles were confined upon another ear, the husks of which were very tight. October 9th, the beetles all remained and one was eating a burrow through the silk toward the corn, which it had nearly reached. Some of the others with surprising strength had wedged their way between the tightly closed husks well toward the base of the ear.

It will be noticed that in all these experiments the same beetles were used, being transferred from one ear of corn to another. They were therefore compelled by stress of circumstances to perform the work that they did or starve, which none of them did, a significant fact. But it may also be remembered that they at first had abundance of food on the ears that were opened for them, so that they were in no degree in a starving condition, when placed on the tight ears.

It may be objected that the beetles, being first given opened ears, had an opportunity to cultivate a taste for this food, but as it was our point to determine whether they had the power to enter husks, it will be seen that it was as well to work with individuals that were known to have a taste for this

food. There is, we believe, no question at all as to the beetles having at times a fancy for this diet.

#### CONCLUSION.

We conclude from these experiments, which support the statements of Mr. Reed, that this beetle has the power of entering, unassisted, the husks of corn ears, either by burrowing through the silk, or by pushing aside the husks, and that they will so enter the ears if forced to do so to obtain food.

It is a fact, however, that should be noted, that this is not the natural food habit of the insect and that it is not likely to assume it in a destructive manner, except when food more to its liking is wanting, and it is not likely to be often destructive in this manner.

---

## SOME IOWA CLOVER INSECTS.

---

### THE CLOVER LEAF-HOPPER.

(*Agallia sanguinolenta*, Prov.)

This little leaf-hopper is quite distinctively a clover feeder, though not confined to it exclusively. We have found it feeding freely upon the sugar beet, more sparingly upon rutabagas and cabbages, and to a less extent upon blue grass at some seasons of the year. It also feeds upon pig weeds and other garden weeds. It is noticed on blue grass, especially in fall and winter and it was from observations made at this time that it was supposed at first to be quite strictly a grass feeder. (See Bulletin 22, Div. Ent. U. S. Dept. Ag.)

It is about one-eighth of an inch in length, quite broad, about half as wide as long and marked with numerous dark blotches and short stripes, especially on the wings.

It hibernates during the winter among dead weeds and leaves and may be seen hopping actively about on sunshiny days in midwinter. It is among the first insects noticed in spring and can be driven from its retreats under trash, piles of hay, etc., at any time in early April.

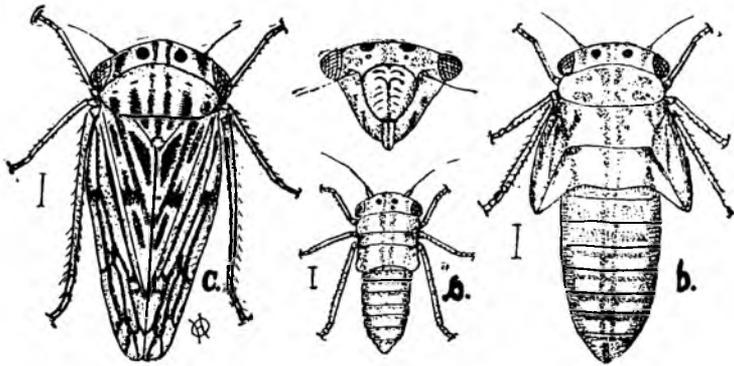


Fig. 2. *Agallia sanguinolenta*; A. larva; B. pupa; C. imago, and front view of head of imago. (Original). Size lines are a little too long.

April 15th, we confined several in a breeding jar upon growing blue grass. April 24th, they were observed copulating. April 26th, all were dead. Where they fed upon the blue grass their punctures appeared as small white spots, the epidermis only remaining about the point from which they had sucked the nutritive juices of the blade.

April 27th, some specimens taken in copulation in the field, were confined on growing clover. Their liking for the clover as compared with blue grass was very apparent and we had no difficulty in carrying them forward on this food plant. They preferred to feed by inserting their beaks in the petioles, or stems, of the leaves in which position they would remain motionless for hours at a time sucking out the juices of the plant. They would also sometimes feed upon the blade.

The wilting of the clover from their incessant drains upon it was evident and it was only by frequent and generous watering that it was kept growing. By the middle of May few specimens could be found outside of clover fields and sweepings made at intervals throughout the summer failed to disclose them elsewhere in sufficient numbers to attract much attention. During October they could again be found in blue grass patches and about weedy spots to which they migrate on the approach of winter, or perhaps as soon as their favorite food plant begins to show the effects of cold weather.

From their numbers in this locality and their method of attack we should count them among our most serious clover insects.

The first larvæ were found in our breeding jars May 20th. They much resemble the adults except that they are smaller and nearly white in color. A few eggs were observed inserted beneath the epidermis along the midrib of the blade. Most of the eggs must have been laid elsewhere, however, probably among the bases of the petioles about the crown of the root, or beneath the epidermis on the petiole where they would not be easily discovered. June 9th, the wings of the older nymphs nearly covered the body and by the first of July, they were mature. Hatching at this time was still in progress, so that we had every stage in the life-history of the insect represented at the same time in our cages. Nymphs in all stages were found from this date until late autumn, the new adults doubtless beginning egg laying in July, or August, and the larvæ of the first brood would be maturing all through the months of July, August, and possibly September. The earliest adults of the second brood might have time to oviposit and produce a third brood in autumn, some specimens of which could mature, but we have no doubt that the great majority of the insects are included in two broods. This conclusion seems probable to us from the rate of growth, and the fact that few nymphs are to be seen late in fall. We have found none in spring and think that the belated ones of fall perish during the winter.

Where the insect demands remedial measures, we recommend that the flat leaf-hopper dozer described in Bulletin 14 be dragged over the clover field just after the first cutting in July. At this time they will be at the proper stage of growth to be easily caught and a great many young grasshoppers as well as other clover enemies will be taken also.

### THE CLOVER SEED-CATERPILLAR.

(*Grapholitha interstinctana*, Clem.)

In Bulletin 14 of this Station, the life history of the Clover seed Caterpillar was published as fully as the facts then in our possession would permit. The facts as given may be summarized as follows:

The spring brood of adults was first observed about the 20th of May, and disappeared about the 20th of June. The

first brood of larvæ were found nearly mature on the 24th of June, and infesting over fifty per cent of the clover heads examined. The second brood of adults appeared a short time before July 14th. The second brood of larvæ were found about August 5th, and the second brood of adults had disappeared by August 20th. The work of the second brood of larvæ was exactly similar to that of the first brood and perhaps more destructive. The injuries inflicted by this insect and the Clover-seed Midge on the clover seed crop, combined with the injuries inflicted on the clover hay crop by Grasshoppers, the Flavescent Clover Weevil, the Clover Leaf-hopper mentioned elsewhere, and other insects rendered the second crop of clover too worthless to pay for harvesting in some places, and some fields upon the College Farm remained uncut.

Observations made since the publication of the last Bulletin complete its natural history as follows :

The third brood of adults appeared some little time before September 8th. September 19th, the third brood of caterpillars were found working among the bases of leaves near the roots, *Grapholitha interstinctana* being without question the insect mentioned by Prof. Gillette in Bulletin No. 12 of this Station. October 9th, some adults of this brood appeared, thus showing the tendency of the insect to become four-brooded. It is doubtful however if the few specimens of this brood had time to deposit eggs which could produce a fourth brood of caterpillars occurring in conjunction with the third brood, the great majority of which at the present writing, November 13th, are hibernating among the leaves near the roots.

A few have pupated, but the majority are quiescent caterpillars that will doubtless become active with the return of spring, when they will eat a hearty meal and pupate, and appear as adults some time in May.

Remedial measures must be directed chiefly against the first and third broods, it seems to us. We have already recommended the cutting and storing of the first crop, when the first brood of caterpillars is in the heads, or in early June. The third brood could be destroyed by plowing under late in fall during the month of October, or in early spring before the end of April.

Where plowing under is not desirable, we believe that careful attention to the first method, if generally adopted, will prove entirely sufficient to keep this insect in check.

We have reared no parasites from this insect as yet, but have noticed several species of polished, four-winged insects belonging to parasitic families darting about in infested fields, and we have little doubt that their business is to prey upon the caterpillars and to assist in reducing their number.

## THE CLOVER DRASTERIA.

(*Drasteria erechtea.*)

This moth is one of the most common that we have, repeating its appearance year after year from early spring until late fall in considerable numbers. While never appearing in sufficient numbers to threaten the clover crop upon which it feeds, its continual presence in moderate numbers makes it worthy of attention.

The following statements are taken with but little modification from Saunders and French :

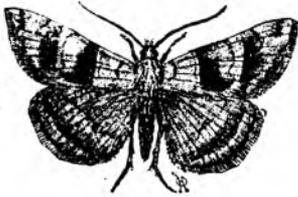


FIG. 3.

The moth with expanded wings measures about one and one-half inches across. The front wings are grayish-brown with bands and dots of dark brown, one crossing the wing about an eighth of an inch from the base; a second, which does not always extend entirely across, is placed midway between the first and outer edge of the wing, between the first and second bands, and two or three prominent black dots similarly situated between the second band and the apex; the outer edge is also widely margined with brown. The hind wings are similar in color to the front ones, but paler and more indistinctly marked. The brown markings sometimes pass into a very close approach to black. The accompanying figure is drawn from a typical, distinctly marked specimen.

It is abundant in fields and meadows, and upon being disturbed starts up very suddenly and after a short and rapid flight as quickly alights.

The caterpillar is one and one-quarter inches or more in length, with a dark striped, reddish-brown head, and body reddish-brown above, with many longitudinal lines and stripes of a darker color and a double whitish line down the back. The under surface is a little darker than the upper, with many longitudinal lines of a still deeper shade and a central stripe of blackish green from the sixth to the ninth segments. It has but three pairs of prolegs and loops like a geometer larva in progression.

When about to pupate it fastens several leaves together, lines them with silk and then changes to a chrysalis, in which state it passes the winter.

A period of from 41 to 66 days is required to pass from the egg to the adult, the majority requiring a little over a month and a half, which would give three broods in a season.

We think that incidental remedies directed against this insect will be sufficient; *i. e.*, measures against other insects can be so timed as to include this one. The eggs, larvæ, and pupæ will be destroyed by plowing under during the last half of October, an operation we have recommended to be used at the same time for destroying the Clover-seed Caterpillar.

### THE CLOVER HAY-WORM.

(*Asopia costalis*, Fabr).

The natural history of this pretty little moth, the larva of which is known as the Clover-worm, was first studied by Dr. C. V. Riley, in 1867. Prof. F. M. Webster, of the Ohio Experiment Station has recently contributed some additional facts, and we draw the following statements from their publications :

The moth often finds its way into our dwellings during the summer months, being attracted to light, and on cloudy days and in the dusk of evening may be seen flitting around clover stacks. When its wings are spread it measures about eight-tenths of an inch across. The wings are of a lilaceous purple, the front pair being divided into three nearly equal parts by two large, bright golden-yellow spots along their margins. Both pairs of wings are margined with deep orange and fringed with golden-yellow. The under surface is paler with the markings less distinct.

The eggs are fastened to such clover as the females can find access to by creeping into the crevices and fissures which a stack affords, and Prof. Webster's observations make it seem probable that they may be laid in the heads of growing clover in the open field. The larva is hatched in a few days in summer. It is of a dark olive-brown color, nearly three-quarters of an inch in length, tapering each way, with a body much wrinkled, and they usually dwell in a cylinder of silk. It is stated that there are doubtless more than two broods in a year and the larva may be found in mid-winter of all sizes, retaining activity with the thermometer below the freezing point. They have the power of readily spinning a silken thread by means of which they suspend themselves in mid-air. The cocoon is formed in some crevice or other hiding place, either nearly outside or entirely away from the stack or mow in which the larva has been feeding. It is particularly destructive to stacked and mowed hay, interweaving it and covering it with white silken webs and black excrement resembling gunpowder, so as to destroy it for feeding purposes. A foot or two in the bottom of the stack is often entirely ruined. Preventive measures are recommended as follows: First, since the worms feed chiefly upon dry clover, in the mow or stack, they must be confined during the summer months, principally, to the unfed hay stacked the previous year. Therefore new hay should not be stacked in contact with old, especially not on old and infested foundations. Second, since the worms show a tendency to seek the moister and more compact portions of the stack, descending towards its base, it is advisable to build on a rail foundation. This gives an air passage underneath, and is, besides, a commendable practice. Third, salt well the hay within two or three feet of the ground, as the worms do not like well salted clover.

Should the habit of the larvæ, feeding in the growing heads, as discovered by Prof. Webster prove true in the open field as well as in the breeding cage, it will be necessary to use some remedy at the time of stacking infested hay. Prof. Webster thinks he obtained encouraging results by thoroughly dusting some infested hay that was restacked with a

mixture of one part, by weight, of powdered pyrethum and five parts of flour, as the stacking proceeded.

### SOME INSECT ENEMIES OF THE SUGAR BEET.

The sugar beet, like other garden crops, is injured to a large extent by insects. Cut-worms threaten the young and tender plants in spring, leaf-hoppers sap them at every stage of growth, and blister-beetles, grass-hoppers, and other insects eat the tops and roots in summer and autumn. We have made no exhaustive study of beet insects as yet, though a number have been observed in this locality. Prof. Bruner, in Nebraska, has begun their investigation, and we have made free use of his preliminary article on sugar-beet insects, and some species mentioned by him are treated here, although we have made no personal observations on their injuries to the beet crop.

#### CUT-WORMS.

The first insects noted at Ames, as doing serious injury to the young beets in 1891, were Cut-worms. These pests, of which there are many different species, need no introduction to farmers and gardeners, since they make known their presence every year by destroying a great variety of plants. Though each species of Cut-worm may differ in habit in some respects from any other species, those species which affect the sugar beet agree sufficiently in their mode of living to make a general notice suffice for all. These "worms," as they are called, are the caterpillars of a family of owlet moths, so-called from their habit of hiding by day and flying by night. These "worms," are usually dark colored, range from an inch to one and one-half inches in length, and have a few sparse hairs on their sleek, fat-looking bodies which are generally banded or clouded in variegated patterns, with brown and black. The moths are also dull colored with short thick bodies, the fore-wings of a dark brown, dull gray, or black, and figured with various designs in lighter colors, and in some cases spotted with white. The hind pair of wings is lighter colored and unfigured.

Some species of the larvæ, or "worms," may be found in midwinter hibernating under boards and chips lying on the

ground, or hidden under rubbish and in sheltered places, ready to come forth with the proverbial "bear's appetite" in spring, and woe to the early garden or bit of green that comes in their way. They feed at night, and bury themselves an inch or more in the earth near where they took their last meal, if no other hiding place in shape of chip or rubbish is at hand. By digging them out you have the satisfaction of killing the insect, losing the plants it has eaten, and preventing its further marauding. By dotting the ground with holes, made by thrusting a sharpened stick into it, many of the "worms" will be starved to death by falling into the holes and being unable to get out again. The most satisfactory method known to us of fighting them, is to take bunches of green clover, cabbage leaves, or something similar, loosely tied, and immerse in a solution of London purple or Paris green in the proportion of about a tablespoonful of the poison to a pail of water. Towards night scatter these poisoned bunches on the ground infested by the "worms" and they will eat of the bait, bury themselves beneath the earth again and die. These poisoned baits should be renewed every two or three days and the failure to find dead "worms" on the surface of the ground should not be regarded as a discouragement, for as we have already stated, most of the "worms" will be their own sextons and attend to their own burial.

Cones of tar paper or of tin set about the plants will protect them effectually, if they project at least an inch above the ground. When a limited number of any sort of plants attacked by Cut-worms is planted, this method can be safely recommended as reliable and inexpensive.

### GRASS-HOPPERS.

The beets were approaching maturity before the grasshopper broods were old enough to greatly injure them and grass-hoppers are not partial to beets, but the numbers of them which we observed in the beet plot in the latter part of the season, and evidences of damage done by them to the beet-tops, lead us to give them a place among the insects which feed upon the sugar beet.

The species that were most numerous were *Melanoplus femur-rubrum*, *Caloptenus differentialis*, *Chloëaltis curtispennis*, and perhaps *Acridium emarginatum*.

For notes upon these insects and methods of destroying them we refer to Bulletin No. 14 of this Station.

In fields where the methods there described cannot be effective, and which are removed from animals and fowls, we suggest a mixture of bran, arsenic, sugar, and water, as recommended in the report of D. W. Coquillett, of California, to the United States Entomologist in 1885. This preparation is mixed as follows: Fill a half-barrel about three-fourths full of dry bran and to this add one-sixth part by weight of arsenic (about 5 lbs.), and stir thoroughly through the bran with a spade or shovel. Put an amount of sugar equal to the weight of the arsenic in the pail, then fill with water and stir until it is dissolved, and add this sugar-water to the bran and arsenic, and stir well. More water is then added and the stirring continued until every portion of the mash becomes thoroughly saturated, when it will be ready for use. It should be placed in little piles upon the ground in the beet patch and all domestic animals carefully excluded. It should not be put on the ground at a period nearer than three weeks to the time when it is intended to harvest the beets. The grass-hoppers eat of it readily and are destroyed by thousands. It is best to put the poison out before the period of egg-laying, so as to lessen the next year's brood.

Mr. Gregory, a gardener near Ames, has used a similar method in preventing grass-hopper injury in his gardens and reports most excellent results.

The greatest objection to this method is that it may prove the destruction of many small, insectivorous animals as well as grass-hoppers. We believe that, if the grass-hoppers are treated with hopper-dozers as we have previously recommended for the edges of fields and pasture land, and if fields containing eggs are plowed at seasonable times, these insects will need no further attention.

#### BLISTER BEETLES.

Four or five species of blister beetles are numbered here as insects injurious to various garden products, beets included.

These blister beetles are rather long and soft-bodied, the Striped Blister Beetle, or "Old Fashioned Potato Bug" (*Epicauta vittata*), being an example. Other species common are the One-colored Blister Beetle (*Epicauta unicolor*), the Gray Blister Beetle (*Epicauta cinera*), and the Black Blister Beetle (*Epicauta pennsylvanica*).

They prefer to feed in large companies and are very unstable in their fancies for diet. One year they prefer this sort of food, and the next year, that. They quickly strip any plant upon which they settle of all portions which they can eat.

In their larval stages these beetles are among our most beneficial insects, depending for their existence upon grasshopper eggs. Hence, when grasshoppers are abundant, we may expect an abundance of blister beetles to follow them, since the young will be well supplied with food. If food is scarce, the larva has the power of postponing its changes so that it may not appear as an adult blister beetle for one, two, or even more years, thus possessing a safeguard for the continuation of the species. The desirable habit possessed by the larva of eating grasshopper eggs makes it questionable whether the adult insects should, or should not be destroyed, even when they are doing great damage to our gardens. They should be driven away if possible, by being beaten off the beets, but if nothing else can be done, they may be beaten into a vessel containing a little kerosene which will kill them. The plants may also be sprayed with either London purple or Paris green in the proportion of four ounces to the barrel of water.

## FLEA-BEETLES.

### THE WAVY-STRIPED FLEA-BEETLE.

(*Phyllotreta vittata*, Fabr).

This beetle is a familiar one, about one-tenth of an inch long, shining black in color, except that the wing-covers are banded length-wise with a broad wavy stripe of pale yellow. Its hind thighs are enlarged so as to enable it to make great leaps, from whence comes its common name, flea-beetle. It is partial to plants of the mustard family, e. g., cabbages, turnips, mustard, shepherd's purse, etc.

The larvæ feed under ground on the roots of the same plants, often ruining entire gardens of cabbages, turnips, and radishes. They attack the beet-tops in the same manner that they do the plants previously mentioned, and can be reduced, or driven away by the use of kerosene emulsion. When it is not intended to use the tops as feed for stock, a mixture of London purple or of Paris green and water can be applied.

#### THE TRIANGLE FLEA-BEETLE.

(*Disonycha triangularis*.)

The Triangle Flea-beetle was observed in considerable numbers this season. It gnaws the leaves full of holes, eating away the outer parenchyma, thus leaving the plant with a blister-like appearance, which without examination might be mistaken for a leaf-spot disease or a blight. Remedies, the same as for the preceding species.

*Phyllotreta albionica*

is common here and is listed as a beet insect on authority of Prof. Bruner. Treat the same as the preceding.

#### WIRE WORMS.

Wire Worms are hard, smooth, cylindrical larvæ of a light yellowish, or a straw-yellow color as a general rule, and are found affecting the roots of various plants, especially crops that have been planted on new ground that has been in grass a year or two previously. They damage the beet by boring into the root or by cutting off the fibrous rootlets thus causing the plant to shrivel up and die. The duration of the larval stage with Wire Worms is not definitely known, but is supposed to be at least two or three years. The adult insects derived from the Wire Worms are the common Snapping or Click-beetles that come so readily to light. The only manner of preventing their injuries is to select ground that is not infested. They may be depended on to mature and leave the field they infest in the course of two or three years.

## TRUE BUGS.

Of the true bugs, possessed of sucking beaks and represented by the Bed-bug, Chinch-bug and others, several may be counted as injurious to the sugar beet.

## THE CLOVER LEAF-HOPPER.

(*Agallia sanguinolenta*, Prov.)

This insect, which we have treated at length under the head of Clover Insects is also a persistent feeder on beets. It will evidently be impossible to use the Leaf-hopper dozer with advantage among the growing beets, and we believe that kerosene emulsion well applied will be an effectual check upon them, and will also destroy

## BEET-LICE,

a species of which was observed here this season.

## OTHER TRUE BUGS.

Other true bugs, which are injurious to the sugar beet are the Gray Plant-bug (*Piesma cinera*), the Tarnished Plant-bug (*Lygus pratensis*), and the False Chinch-bug (*Nysius augus-tatus*).

THE GRAY PLANT-BUG is often mistaken for the Chinch-bug, being about the same size and emitting a similar odor. It differs in many other respects, being flatter, broader, and lacking the black and white markings which characterize the Chinch-bug. It attacks grape-vines, and small trees sometimes when it cannot get its favorite food which consists of the various pig-weeds, tumble-weeds, etc. It attacks the beet readily and should be reduced by keeping all land free from weeds. All weeds which have been carelessly allowed to grow during summer should be burned in winter, since many insects hide among them.

THE TARNISHED PLANT-BUG is one of our most numerous insects and is a very general feeder. It is often injurious to expanding buds of pear, and apple, and also to the unopened buds. It is a common occupant of purslane and weed patches

in autumn, where it hibernates through the winter. It attacks beets and should be treated as the Gray Plant-bug.

THE FALSE CHINCH-BUG (*Nysius augustatus*) is a grayish-brown insect and perhaps is more often mistaken for the Chinch-bug than any other species. It has the characteristic bed-buggy odor of the Chinch-bug and resembles it a good deal in general appearance. It prefers to feed on plants of the mustard family, but will also attack potatoes, grapes, etc. It gathers under purslane and similar weeds to spend the winter, and should be treated as other insects of similar habit.

THE PURSLANE OR LARGE-EYED GROUND-BUG (*Geocoris bullata*) is found here and is also very common further west. It is very fond of purslane, and also feeds on pig-weed, smart-weed, beets and some other plants besides. It attacks grapevines and small trees in spring before the weeds have started.

#### INSECTS ASSOCIATED WITH ROTTING IN BEETS.

During the fall, Prof. Curtis brought us some beets that were rotting, and in which there were a number of insect larvæ, mites, and nematode worms. The relation that these bear to the rot is difficult to state with certainty, but for the most of them it is probable that they collect upon the beets after the rotting has begun and that they are not the original cause of the trouble, though it is possible that their presence may assist in the hastening of the decomposition.

The most conspicuous of the larvæ was a dipterous one belonging to the genus *Homalomyia*, the larva being broad and somewhat flattened, and the sides of the body armed with bristly tubercles or spines. An adult fly was reared from the cage in which these were kept and is, pretty certainly, the adult form, but it does not agree with any described species known to us. This species would seem capable of doing some direct damage to the beets and the fact that full grown larvæ were found in beets where the rotting process had not been long under way would rather indicate that they might possibly have hatched from eggs laid on healthy or but slightly injured beets.

Related species are known to live in decaying vegetation and it would require careful breeding upon fresh roots to prove it could cause rotting in uninjured plants.

Another dipterous larva was present in still greater numbers, but this seems, quite certainly, to occur only in the rotting roots.

Some small mites of the order *Acarina* were also rather common and looked like minute eggs in the cavities of the rotting mass. From their occurring mainly in such cavities and away from the fresh tissue, it is pretty certain that they are attracted by the decaying mass and do not originate the decay.

The Nematode worms were of a small species and while occurring in considerable numbers and possibly invading fresh tissue, so as at least to hasten the decay, it is by no means certain that they could enter uninjured tissue. It will be of interest and importance to get additional information regarding their relation to the disease, and we trust we may be able to study it further another season.

#### SUMMARY OF ENTOMOLOGICAL ARTICLES.

The common Indian Cetonias, *Euphoria inda*, was destructive to corn at Coon Rapids, and experiments at the Station show that it is capable of entering uninjured ears of corn for the purpose of feeding. It is considered, however, that this is somewhat exceptional, and is likely to occur only when their more common food is deficient.

The Clover Leaf-hopper, *Agallia sanginolenta*, has been traced through its transformations and found to develop fully on a diet of clover, and it is probable that this is its more common food, but that it attacks also grass, beets, various weeds, and other plants, according to abundance, or season. For treatment the hopper-dozer plan is recommended in grass and clover, and kerosene emulsion on beets.

A few additional facts are given regarding the Clover-seed Caterpillar, treated in the preceding Bulletin.

The Clover Drasteria is discussed and suggestions made as to methods of reducing its numbers in clover fields.

The Clover-hay Worm, *Asopia costalis*, is treated with reference to the important steps in its life history, and remedies discussed.

Under the head of Some Insect Enemies of the Sugar Beet, a number of the common enemies of this crop, which now promises to be one of no little importance in the state, are treated briefly under the sub-heads, Cutworms, Grasshoppers, Blister-beetles, Flea-beetles, Wire-worms and True Bugs, the methods of treatment of each species being discussed in brief.

Some insects associated with rotting in beets are mentioned and their relation to originating the decay discussed.