the female in color and markings. The median space is smaller and less well-defined, the markings are slightly less distinct, and it is smaller in size. Both sexes have the dark brown or black tufts on the dorsum of the abdomen, and the male has the brown antennal tufts and the longer anal tuft which are sexual characters.

The specimens reared are somewhat more of a reddish brown tint than one would expect from Grote's description, yet there is a distinct olive tint on the basal two thirds of the secondaries.

Larva. Length, about one and one-half inches, thickness about three sixteenths of an inch; somewhat flattened and thicker laterally than vertically. Ground color black dorsally, brown ventrally. Marked dorsally and laterally by small white irregular shaped spots arranged rather irregularly as follows: Two transverse rows on each segment as seen dorsally; three longitudinal rows as seen in lateral view, one nearly in line with the spiracles, one above and one below, these being in addition to the transverse dorsal rows of spots. Sometimes a fourth longitudinal row may be made out below the other three and at the base of the legs and pro-legs. Head dark brown or black, sculptured or pitted and shining; marked with white patches more or less irregular in shape, the arrangement not entirely symmetrical. Legs black and shining, with white patches on the first and second basal joints. Head and body sparsely covered with nearly straight light and dark hairs of medium length.

The larvæ, adults and nests are shown in Plate 20. Credit is due to my assistants, Messrs. B. H. Walden and A. B. Champlain, to the former for making the photographs and to the latter for the drawing of the larva. Also to Professors J. B. Smith and H. T. Fernald for the courtesies already mentioned.

INSECTS OF THE YEAR 1911 IN IOWA.

By R. L. WEBSTER

The year 1911 in Iowa was characterized by an early spring and a long, dry summer. These weather conditions had much to do with the oscillations of insect life in the state during the year. The following notes deal with some of the more important insects on which observations were made this year in Iowa.

Lepidosaphes ulmi Linn. Not until this year did I realize what an important enemy to the apple tree was the oyster-shell scale. In the northern part of the state a large number of orchards are infested with this insect, many trees being very badly injured and some even killed by the scale. In March of this year I made a 40 mile auto trip in Worth county, in the northernmost tier of counties in the state, and found that scarcely an orchard in the county was not infested. Most of them were seriously injured. From observations made elsewhere

in northern Iowa it seems probable that other counties are equally as well infested with the oyster-shell scale as Worth county.

All of the samples of this scale which have been sent in to the Experiment station in recent years have come from the northern half of the state. The scale occurs in southern Iowa, but rarely, and when it is found, the infestation is light. I am not sure what is the cause for this difference, but think likely that it is on account of more favorable conditions for the development of certain natural enemies of the scale. This is probably especially true of certain mites, concerning which I shall have more to say at another time.

Monostegia ignota Norton. This strawberry slug, or at any rate the species which has gone under this name, was very common in strawberry patches about Ames early in the spring. In one instance strawberry plants in a small field were practically eaten down to the ground by these slugs.

According to F. W. Mally there are in Iowa two common species of strawberry slugs.¹ These are quite similar and are doubtless often taken for a single species. In making some notes on these strawberry slugs this spring Mally's observations were found to be essentially correct. The second species of strawberry slug, *Harpiphorus maculatus* Norton, is fairly common in Iowa, although the first named species has been causing the more damage. This is probably due to the fact that the former species appears earlier in the spring, when the strawberry plants are smaller and less resistant to insect injury.

Meliana albilinea Hübner. The wheat-head army-worm, which caused much damage to timothy in northern Iowa last year, was practically lost sight of this year. Early in June it looked as if much injury would be done, since the partly grown larvæ were very common in many places. The continued long period of dry weather, however, completely dried out the timothy plants and heads, as well as other grasses, and the larvæ were left without suitable food. The drought checked the wheat-head army-worms as well as the timothy.

Epitrix cucumeris Harris. The potato flea-beetle was again abundant in Iowa this year. Around Ames much injury to the tubers was noticed, as well as to the foliage. The tunneling into the tubers was found to be essentially as described by F. C. Stewart as occurring in New York State.²

Eriocampoides limacina Retzius. The pear-slug was less abundant at several places in the state where it has been common for several years. This decrease in numbers seems to have been due, for the most

¹ Insect Life, vol. ii, p. 137.

² N. Y. Agr. Exp. Sta. Bul. 113.

part, to the abundance of one of its egg parasites, *Pentarthron minutum*, Riley.

Carpocapsa pomonella Linn. The destructive spring freeze of last year, which played havoc with fruit in the state, had its effect on the codling moth as well as on the fruit. Where there were any apples at all last year, the codling moth was fairly common this year. But where all the fruit was lost, the insect was very rare indeed.

About Ames, where there were a few apples last year, the codling moth infestation was about normal, possibly slightly less than normal. Two varieties of apples, Wealthy and Ralls, came through with a fair crop last year, but practically everything else was killed by the frost.

In July I made a short trip in southwestern Iowa, where the fruit industry is of some little importance. About Glenwood, in Mills county, scarcely a sign of a wormy apple was found. I found one wormy apple in a day's time spent in orchards about this place. A very few second brood eggs were seen at this time, but not many. Practically all the orchards in this county were unsprayed, which fact makes the absence of the codling moth all the more notable. Most of the orchards had never seen a spraying outfit.

South from Glenwood, about Hamburg, close to the Missouri line, there was more codling moth injury in the orchards. Here, again, there were some apples the year before, so the larvæ were not completely starved out, as at Glenwood. The infestation around Hamburg was light, however, and since much spraying is done there, the insect was well kept in check.

Canarsia hammondi Riley. At Randolph, in southwestern Iowa, I ran into a severe infestation of the apple leaf skeletonizer in July. This insect is not an uncommon one in the state, although it rarely occurs in abundance. In this particular orchard at Randolph every tree was more or less injured. The damage was mostly in the top of the trees, and always on the young growth. At the tops of the trees the young branches were eaten back from one to two feet, so that the upper parts of the trees were bare and brown. These trees were sprayed with arsenate of lead for the codling moth after the blossoms had fallen, but not again that season. Since the skeletonizers kept to the younger growth they avoided the poison to a great extent. A considerable amount of the arsenate of lead was found still adhering to the leaves late in July, the scant rainfall of the season being insufficient to wash it all off.

Grasshoppers. Three species of grasshoppers were abundant in Iowa this year, *Melanoplus bivittatus* Say, *Melanoplus femur-rubrum* DeG., and *Melanoplus differentialis* Thos. Much damage was done to corn and also to small grain. Even apple trees in the vicinity of

infested pastures or meadows were defoliated. The weather conditions in this case had much to do with the damage done by the grasshoppers. The dry weather had kept the pastures bare for a long period during the summer, so that the grasshoppers were forced to find their food elsewhere, consequently the damage to grain crops.

In August a number of newspaper reports were noticed which gave accounts of flights of the grasshoppers. These were mostly from northern Iowa.

Blister beetles. Two species of blister beetles, *Epicauta vittata* Fab. and *Epicauta pennsylvanica* DeG., were common in Iowa this year. The former species was abundant on potatoes, the latter on alfalfa, potatoes and corn. One farmer near Spencer, Iowa, told me that the black blister beetle (*Epicauta pennsylvanica*) literally cleaned out a field of alfalfa for him.

Since the grasshoppers were very common in the state, there should be plenty of grasshopper eggs for the blister beetle larvæ this fall, and it is certainly safe to prophesy an abundance of these two species for next year.

Chatocnema elongatula Crotch. This tiny, black, flea beetle, kindly determined for me by Prof. H. F. Wickham, was found causing very serious damage to apple foliage in an orchard near Storm Lake, Iowa, in August. The injury to the foliage made itself known by a dried appearance around the outer margins of the leaves. This was caused by the removal of the upper epidermis, which allowed that part of the leaf to dry out. Whole trees were brown and ragged from the injury. Where the damage was worst many leaves were cut nearly into shreds. On some trees not a leaf had been left uninjured, so that the damage had been very severe and was very conspicuous.

At first I could not detect the cause of the injury, but finally found the beetles fairly common on the leaves. The worst of the damage had been done, apparently, when I examined the leaves, and the beetles were no doubt decreasing in numbers. The owner of this orchard told me that he noticed the injury in June or July, while I did not visit the place until August.

The orchard was an old one, and in sod. Possibly the larvæ of this beetle may have been breeding in the sod, and suddenly becoming numerous, caused the damage to the foliage. I am not aware that this species has ever been recorded as being of any economic importance.