

growth before the grubs are actively feeding the following summer, is a good crop to follow on grub-infested land. Likewise small grain crops are not greatly injured by grubs and should be used for grub-infested ground in preference to the more susceptible crops such as corn. Aside from the rotations mentioned above, it is desirable to so arrange the crops that the least amount of land will be in timothy and small grain the year the beetles are abundant, and the following year to plant corn or other susceptible crops in corn ground or ground which was kept thoroughly cultivated during the flight of the beetles the year before, and to plant small grain or clover on ground which was in these crops the previous year.

The farmer should plow land suspected of containing grubs previous to October 15 the fall following a big flight of beetles and select a crop for the following year according to the presence or absence of grubs.

MISCELLANEOUS DIRECTIONS.—The collection of the beetles by hand or by means of a trap lantern, or by spraying trees upon which they feed with an arsenical, has been employed in certain European countries and no doubt would prove of value in this country, but to be effective it is necessary that entire communities work together and adopt the measures.

Collecting the grubs behind the plow by hand, utilizing boys or cheap labor for this purpose, is of much value although similar results can be obtained by employing hogs or chickens as mentioned above.

FURTHER NOTES ON DIPRION SIMILE HARTIG

By W. E. BRITTON, *State Entomologist, New Haven, Conn.*

The writer has already called attention in the JOURNAL OF ECONOMIC ENTOMOLOGY (Vol. 8, p. 379, June, 1915), to the occurrence of this European pine sawfly in Connecticut. That article will enable one to recognize the species, and also points out the possibility that it may prove a destructive pest in this country as it is in Europe. He now wishes to add a few data collected in the further study of this insect since the former article appeared in print.

Diprion simile is present in Connecticut not only at New Haven, but also at Derby, ten miles westward, at Hartford thirty-seven miles northward, and at New Canaan, about thirty miles, and Greenwich about forty-five miles westward. Greenwich and New Canaan are border towns adjoining New York state where it may be expected that this insect will soon appear.

As this sawfly was found to be present in five rather widely separated localities in Connecticut, it was probably too late for extermina-

tion, and therefore only control measures were put into effect. These consisted of a careful inspection in summer and collecting all larvæ found; thoroughly spraying with lead arsenate all trees infested; another careful inspection in late fall and early winter to gather all cocoons from the twigs.

The insectary records were kept by my assistant, Mr. M. P. Zappe, to whom I am indebted for some of the data included in this paper.

During 1915, two complete generations were reared and a number of males of the third generation emerged late in the fall. Possibly another year we may be able to obtain three complete broods, because on account of an accident some of the first second-brood larvæ died. The broods overlap and are rather irregular. Some of the overwintering pupæ did not produce adults until after the first generation of larvæ had matured. If the needles became dry, as is sometimes the case with cut twigs, the eggs failed to hatch. Unfertilized eggs hatched, and the larvæ developed normally to the pupal stage, in which condition they are now passing the winter.

The average length of the larval stage appears to be about thirty and one-half days.

In Connecticut *Diprion simile* feeds upon the white pine, *Pinus strobus*; the Austrian pine, *P. laricio* var. *austriaca*; the Japanese or Bhotan pine, *P. excelsa*; the Scotch pine, *P. sylvestris*; the mugho pine, *P. montana*; *P. flexilis* and *P. densiflora*. All newly-hatched larvæ died when fed on Austrian pine, but after the first instar they were able to finish their subsequent development upon this food plant. Probably when in need of food this sawfly may attack almost any kind of pine and possibly other conifers.

There is some consolation in learning that *Diprion simile* is highly parasitized, and of the parasites which have been reared up to this time, all are native American species; I am indebted to Mr. S. A. Rohwer of the Bureau of Entomology for their identification. Of 152 overwintering cocoons, 46, or about 31 per cent, were parasitized by the Chalcid fly *Pachyneuron* (*Dibrachys*) *nigrocyaneus* Norton. One specimen each of *Hemiteles utilis* Norton, and a species of *Cerambycobius* were obtained. Tachinid eggs are not uncommon upon the larvæ and *Exorista petiolata* Coquillett was reared from the cocoons.

APIARY INVESTIGATIONS IN MISSOURI

By L. HASEMAN, *Columbia, Mo.*

In the past few years the writer has felt the growing need and demand on the part of farmers and beekeepers for help along beekeeping lines. The state agricultural colleges for years have been teaching