

suggested the use of boiled linseed-oil, and burning it until it became sticky like tanglefoot. Aloes and carbolic acid were added to the mixture and the whole applied to the trees. It proved, I believe, an effective remedy.

Mr. Lyne: I might say that there are numerous washes in operation. Crude coal-tar has been proved effective.

Mr. Tom Wilson: I have tried coal-tar on sapling ash against rabbits; so far as I know, no harm resulted. We used to band holly-trees for half a foot.

Mr. Brittain: Asphaltum is being used largely now. It expands and contracts with the temperature and it is permanent.

Mr. Lyne: This has been experimented with, and I believe that, on occasion, injury resulted.

Mr. Kennedy: I never saw asphaltum used in the Santa Clara Valley, California.

Mr. Lyne: They used whale-oil also.

Mr. Brittain: They also use carbolic and limewash; with a system of "worming" the wash allows one to see the borings better.

Mr. Bonquet: When are the eggs laid?

Mr. Lyne: In July and early August.

Mr. Edwin Smith: Have you any notes on the eggs of *Anarsia lineatella* in fruit and the effect of cold-storage on them?

Mr. Lyne: Refrigerated peaches will come in and they will be pronounced fairly clean. If many crates come in at one time, the merchants unload at their own time. By holding the fruit thus many worms will hatch out.

The Chairman: We will now proceed to the next paper.

CUTWORMS AND THEIR CONTROL.

BY M. S. MIDDLETON, DISTRICT HORTICULTURIST, NELSON, B.C.

The cutworms in the Kootenay and other Interior points did practically no injury this year (1913) to crops. This is attributed to the larvæ having been parasitized last fall. It was almost impossible to find a cutworm this year, where last year they could be found in millions. It seems to be the history of all insect pests taken over a number of years that it is one of epidemics alternating with periods of comparative immunity, which is brought about almost wholly by parasitic attacks. These parasitic controls are of the greatest advantage in keeping down the ravages of all insect pests, and for this reason the study of the new entomology is not only interesting, but, I believe, quite practical at least in many cases. These periodical outbreaks are always liable to appear, however, and we should always be prepared to combat them to the best advantage. We find that the cutworms were extremely bad during the seasons of the years 1900, 1906, and in 1912. They gradually worked up to this epidemic stage and in the year following were extremely scarce.

Although we are able to control the outbreaks of cutworms quite satisfactorily, there still remains a great field for further investigation and experimentation work. It was my intention to have carried on a number of experiments this summer, with the object in view of finding out, if possible, more effective means of controlling these pests, but owing to the immunity this year was unable to do so. We must all feel pleased that the cutworms were scarce and the cause of very little loss this year. I shall have to confine my remarks to the results I obtained last year while dealing with possibly the greatest scourge of cutworms which the Kootenay District has had since the advent of agriculture. The worms were so thick that the ground could be actually seen moving with them, and they could be heard feeding on the clover. In parts the clover-crops were completely devoured by the cutworms. Various controls of poisoned baits were used with varying results.

I found them doing injury to nearly every cultivated plant, including green grain. The greatest losses were caused in the vegetable-gardens and in young orchards, where the worms of the climbing species would crawl up the small trees and eat out the upper buds. This did not result in the killing of the trees, but the

growth would be so checked and disarranged that the trees had to be cut back or reset. In cabbage, turnip, and tomato fields they were very destructive, and in strawberry-beds a great deal of harm was done. In the strawberries the injury was principally on the roots and crowns of the plants. I really think that we have little idea of the great damage done by the cutworms.

Amongst the most common species that we have in the Interior are the red-backed (*Paragrotis ochrogaster*), the greasy (*Agrotis ypsilon*), the variegated (*Peridroma saucia*), and the zebra caterpillar (*Mamestra canadensis*). Some twelve species of cutworms are known in Canada, and our list might be extended to include the following: Yellow-headed (*Hadena arctica*), spotted (*Noctua c. nigrum*), brown (*Nephelades minians*), W. marked (*Noctua clandeckina*), common striped (*Euxoa tessellata*), white climbing (*Carneades scandiens*), spotted legged (*Posograti velusta*), and dingy (*Feltia subigothica*).

The poison bait is possibly the best all-round material to control the cutworms. It is best made by using 1 lb. of paris green, 50 lb. of bran, and about 3 lb. of sugar. The best way to make it is to first moisten the bran a little to cause the paris green to adhere better to it; then add the paris green and mix well. Where large quantities are needed a canvas sheet is a good article upon which to mix the paris green and bran thoroughly. Just spread the moistened bran on the canvas, sprinkle over it the paris green, and mix well by the use of a garden-rake. Then add the sugar as sweetened water. The bait should be considerably sweeter than the plants which the worms are feeding upon. I found much the best results where the bait was well sweetened and well poisoned. Apply the mash fairly dry, just so that it will almost crumble through the fingers, and apply it in the evenings. About 25 to 50 lb. of the mixture should suffice for an acre of vegetables and fruit. Where fruit-trees only have to be treated much less will be required. It is a wise precaution here to keep the mixture well away from the trees or plants, as the arsenic in the mixture will cause scalding of the bark, and in many cases I have seen trees girdled by the effects of the paris green. In the case of fruit-trees and larger plants the use of tanglefoot has given good results in some districts. Just place about an inch strip of the tanglefoot around the trunk of the tree about 6 inches to 1 foot from the ground. This has to be watched closely, lest the dust from cultivating or windstorms might destroy its effectiveness. There was a sticky tree-oil sent out by a Tacoma firm, but it did not give good results, as it melted with the heat of the sun and then crystallized. Banding the trees with cotton batten has also been used to very good advantage. Just take a tuft of batten and fasten it around the trunk of the tree, leaving it loose on top, and the worms will not climb over it. Running chickens in the orchard is also very effective in controlling the cutworms.

Cultivation methods can also be practised to assist considerably in controlling the cutworms. If we could have all weeds and plants cut down each fall a great many of the larvæ and eggs would be destroyed. Cover crops where they have to be left over winter as a protection crop is often bad for harbouring the cutworms, and when ploughed under in the spring the worms flock to the trees in the orchard. By sowing the cover crops a little later the eggs might be destroyed before the cover crop is sown. The worms make their appearance about the middle of May and are bad until the end of June. They then pupate and the egg-laying should be over about the end of August. If these dates are correct the cover crops and protection crops could be sown late in August, when they would not be likely to harbour the worms.

ECONOMIC ORNITHOLOGY.

BY LIONEL E. TAYLOR, F.Z.S., M.B.O.U.

The best definition I can find of "economic ornithology," the title of this paper, is given by Mr. T. S. Palmer in the U.S.A. Year-book of the Department of Agriculture of 1899: "Economic ornithology has been defined as the study of birds from the standpoint of dollars and cents. It deals with birds in their relation to agricul-