apples from infested and uninfested clusters; the relation between spring and fall injury, etc.

The control of bud-moths is discussed at length, the measures recommended being based on a long series of experiments on different varieties of apple, using different sprays and nozzles.

The latter part of the paper is taken up with the detailed descriptions, life-history and habits of the four species discussed.

THE FRUIT WORMS OF THE APPLE IN NOVA SCOTIA. By G. E. Sanders and A. G. Dustan. Bull. 17 (Technical Series), Entomological Branch, Dept. of Agriculture. March 1, 1919. 28 pp., 9 figs. in text.

The fruit worms discussed in this report are the larvæ of a number of Noctuid moths belonging to the genera Graptolitha, Conistra and Xylena. They are important enemies of the apple in Nova Scotia, and the damage which they effect by eating into the young fruit or the set of the apples causes the dropping of about 72 per cent. of the injured fruit and the deforming of about 78 per cent. of the remainder. The commonest species is *Graptolitha bethunei*.

The life-history of the various species is so similar that a general account is given which applies to all. The moths appear in the autumn, hibernate and deposit their eggs on the twigs of the apple during May. "These eggs hatch about the time the apple buds are beginning to show pink. The larvæ feed for two first two weeks on apple leaves and blossoms, and drop to the ground very readily when disturbed. After the first two weeks the larvæ feed more on the fruit than the leaves, causing an immense amount of injury." Pupation takes place in the ground in early July.

Fruit worms are difficult insects to poison, and their control is largely mechanical. The authors find that an arsenical spray applied immediately before the blossoms is the most valuable, while that applied immediately after the blossoms comes next in importance. The pre-blossom spray should be applied at a high velocity in serious outbreaks.

The latter part of the report consists of descriptions of the earlier stages of the nine species of fruit worms discussed.

A CONTRIBUTION TO THE KNOWLEDGE OF THE BOT-FLIES, GASTROPHILUS INTESTINALIS, DEG., G. HAEMORRHOIDALIS, L., AND G. NASALIS, L. By S. Hadwen. D.V.S., (Dominion Pathologist, Health of Animals Branch) and A. E. Cameron, M.A., D. Sc., F.E.S. (Technical Assistant, Entomological Branch), Dept. of Agriculture, Ottawa. Bull. Ent. Research, Vol. IX, pt. 2, Sept., 1918.

An investigation into the life-histories and habits of the three species of horse bot-flies that occur in the western provinces. Detailed descriptions are given of the eggs and the manner of their deposition, the young larvæ and their method of entering the host. Experimental evidence is given to show that the eggs of *G. nasalis* and *G. haemorrhoidalis* are capable of hatching spontaneously, and that the larvæ probably penetrate directly into the integument of their host. The eggs of *G. intestinalis*, on the other hand, require moisture