NOTES ON THE CODLING MOTH.

By Augustus Simson.

[*Read 12th August*, 1879.]

The Codling Moth *(Carpocapsa pomonella)* is attracting so much attention at present that I hope I may be excused for making some remarks upon the subject.

This insect belongs to that family of the Lepidoptera called Tortricidæ (in French, "Tordeuses"), on account of the general habit of their larvæ of "twisting" or rolling up the leaves of plants of their abode, usually those leaves enclosing a young shoot or bud. They then devour such leaves, shoots or buds, to the great detriment of the plant attacked. A few take up their abode in the interior or fruits, especially the apple, pear, and plum.

Professor Westwood, of Oxford, gave a detailed history of the particular species under notice in one of a series of article on insects most injurious to cultivators in England, in Loudon's *Gardeners' Magazine*, of May, 1838, No. 98. In the same work he gave also, in No. 94, January, 1838, the history of *Ditula angustiorana*, the larva of which does great damage to apricot trees, by tying the young shoots together so firmly that their growth is stopped, and by devouring the young blossom buds. *Tortrix viridana* in certain years strips the oak of its foliage. *Tortrix vitana* does great damage to vines in France.

Dozens of other members of the family might be enumerated, all equally mischievous to certain trees and shrubs; I will, however, only mention one more, *Carpocapsa Woeberiana*, the larvæ of which live beneath the bark of plum trees, where they bore cylindrical galleries and feed upon the sap.

It is highly improbable that this insect was brought to Hobart Town in some plums sent from the North. Each species, with very few exceptions, confines itself to a particular plant, or at least to plants of the same genus or order.

It would be interesting to ascertain what the species attacking the plum really is. In a catalogue of European Lepidoptera I possess, the species, *Carpocapsa nigricana*, mentioned by Mr. Abbott, is not given. It may be a synonym for the one above alluded to.

The larvæ of all this family are naked fleshy grubs with a horny head, and possess six pectoral (horny and pointed), eight ventral and two anal (fleshy) feet. Mr. Justice Dobson and Mr. F. Abbott, junr., have so fully detailed the proceedings of the insect in all its stages in their valuable papers read at the Society's meet-

ing in May last, that it is unnecessary for me to make any remark on this point, except to observe that the time of appearance is likely to depend very much upon the season.

The emergence of the moths from the chrysalis state, in which they had remained during the winter, will be hastened by warm weather, and, on the contrary, retarded by a cold spring.

It is most probable that there are two generations in the season. The first originates from the chrysalids which have passed the winter in that stage. These attack the earliest fruit and pass through their transformations in a few weeks, the moths produced therefrom laying their eggs on the later fruit. This second generation only gets as far as the chrysalis stage towards the end of the summer, and remains in that state till the ensuing spring.

As to means of destroying these pests, I would recommend in lieu of the paper suggested by Mr. Dobson, that old bagging, strips of blanket, or some such materials be used. I only recently found quite a multitute of similar larvæ, which had spun their cocoons in some woollen material which was lying on some spars of timber with the bark on.

To render any such plan efficient, it would be well to scrape the rough bark off the trees previously to fastening on the material to be used, so as to ensure the caterpillars spinning on or in the substance applied. This should be tied tightly at the upper end, to prevent the grubs from ascending beyond it, but be left tolerably loose and in creases or folds at the lower portion.

For catching the moths, a plan I use for capturing insects might be adopted with advantage. This is to have a wide-mouthed funnel of tinplate, say 12in. to 15in. across the top, with the tube at the lower end about 1in. in diameter and 3in. long. Stand this in an earthen jar or other vessel, arranged so that there is no outlet except through the funnel. In the jar may be some coarse sawdust or chaff, in which the insects get entangled, or hide themselves. Hang a lantern over the centre of the funnel so that it is partly in the funnel. The moths, attracted by the light, strike the glass and fall through the funnel into the jar, whence they cannot escape. They may be destroyed in the morning by placing the jar before the fire, or in an oven for a short time. With this apparatus, which I occasionally use for capturing nocturnal beetles, I often take great numbers of small moths at the same time.

Scattering old bags or similar things about on the ground under the trees would no doubt lead to the capture of a great many larvæ, especially of those which, lowering themselves, or falling, from the trees at some distance from the trunk, might travel off in some other direction in search of suitable shelter where to spin their cocoons. The ground should previously be cleared of all other rubbish which might afford shelter. The bags should be taken every ten days and be dipped in boiling water, or have some

thrown over them; otherwise the pupæ may have had times to become moths, and the trouble will have been in vain.

I will conclude with a few remarks on the report of the select committee recently appointed to enquire into the subject.

1. In reply to the query about removing the bark, I would suggest that this be done to all trees with rough bark as soon as it is known that the grubs have entered the chrysalis stage, the bark thus removed to be burnt. Then I would apply the bagging before mentioned, not later than early next spring, when the blossoms begin to appear. By the removal of the bark the grubs will be compelled to spin in or under the bagging and be all the more surely detected.

2. The grub could undoubtedly travel some distance, but is sure to remain at the first suitable shelter it meets with.

3. I do not think it necessary for the fruit to fall. Most of these larvæ can lower themselves by a silken thread.

4. The grub requires a shelter of such kind as to allow of its forming a cavity therein, in which to spin its cocoon, therefore the traps ordinarily used for earwigs would be of no use whatever.

5. The particular insect reported on attacks only apples and pears.

6. This query is already answered above.

For the following reasons it is impossible that any information resulting from the enquiry in Portugal into the natural history of *Phylloxera vastatrix* can be of any use in regard to the best means of destroying the Codling Moth :—

The Phylloxera belongs to a different order of insects—namely, the Homoptera, family Aphidæ, or Plant-lice, of which the "green fly" on rosetrees is a familiar example. They are suctorial insects, destitute of jaws, living upon the juices of plants, which they absorb through their proboscis or sucker.

Their transformations are quite different from those of the Lepidoptera, they being active and resembling the perfect insect in both the larval and pupa stages.

Their mode of propagation is quite abnormal, and different from that of all other orders of insects. As this is highly interesting and probably not generally known, I quote a short extract on the subject from Professor Westwood's Introduction to the Modern Classification of Insects :—"Each family of plant-lice in spring and summer consists of individuals always wingless, and of pupæ; all these, however, are females, which produce living young without a previous union with the other sex; and Bonnet, whose researches have removed all doubts upon the subject, has clearly shown that this power is exercised at least through nine generations, which are produced within the space of three months. Whilst

Duvau thus obtained eleven generations in seven months, and Kyber even observed that a colony of *Aphis Dianthi*, brought into a constantly heated room, continued to propagate for four years, with a single impregnation of a female by a male, the young being constantly produced of the female sex. The males, of which some are winged, and others apterous in the same society, are not born until the end of the summer or autumn. They fecundate the last generation, produced by the previously born specimens, consisting of wingless females, which then deposit fecundated eggs, which remain through the winter and produce young in the spring capable of reproduction without fresh impregnation."

It is fortunate for owners of orchards that the Carpocapsa has not the same powers of reproduction as the Aphidæ. Westwood quotes from the *Entomological Magazine* that "troops of Aphides were found in the pips of large sound codling apples." Hop-growers are, I suspect, the chief sufferers in the colony from this tribe of insects, and they may probably gain some useful information from the Portugal report when published, though I believe the Aphis Humuli or hop-aphis attacks the leaves and young shoots, whereas the Phylloxera attacks the roots, and therefore the method pursued for the destruction of the latter may not be suitable for the former.

I shall be much obliged by any one kindly sending me some of the pupæ of the Carpocapsa, or of any other similar insects. These I will endeavour to bring to the imago state, and properly mount for the Museum. It will be best to send the small pieces of bark to which they may be attached, or at any rate to send the whole cocoon, which may be placed in a matchbox with some cotton-wool.