NOTES ON CHRYSOPA OCULATA SAY AND ITS RELATION TO THE ORIENTAL PEACH MOTH (LASPEYRESIA MOLESTA BUSCK.) INFESTATION IN 1930.

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INTRODUCTION

While making peach twig collections for parasite recoveries during the first part of June, a few Chrysopid adults were observed throughout the orchards. No particular attention was paid to this insect until late in July, when adults could be found on almost every tree throughout the orchards of the Niagara district. Several specimens were sent to Ottawa for determination and it was found that two species were represented, viz., Chrysopa oculata Say, and Chrysopa albicornis Fitch., the former being by far the more numerous. Eggs began to appear the latter part of July and could be located in numbers varying from one to four on almost every tree.

We have no previous records of this predaceous insect appearing in such great numbers in the peach orchards of the Niagara district. The cause for such an outbreak this year, although not definitely established, may be explained by the fact that the number of aphids, their usual host, was very limited—apparently due to the very dry weather which prevailed throughout the season. The Chrysopids adjusted themselves to the situation by adopting other sources of food and the Oriental Peach Moth, both in egg and larval stages, seems to have been its favourite host.

Several Peach Moth egg counts which were made at various points in the peach growing district have shown that from 20 to 60 per cent of the eggs were sucked by the chrysopid larvae. The eggs that are sucked are very easy to differentiate from those that are normally hatched by the fact that their shells are flattened down to the surface of the leaves on which they are located and one or two small holes made by the sucking jaws of the chrysopid larvae may be seen at the base of the egg shells.

LIFE-HISTORY AND BIOLOGY

Egg Stage—

The eggs of the chrysopids, which are very easy to distinguish from the eggs of other insects by their gelatinous stalks on which they are normally attached, are elliptical in shape and green in colour. Although they may be deposited in many different ways, the ones observed on peach trees during the summer were generally scattered, that is, only one egg per leaf, and deposited on the under surface of the leaves. On very rare occasions numbers varying between two and five were observed on the same leaf. In such cases they were never closer than eight millimeters to each other, apparently so arranged that the hatching larva cannot migrate on the stalked egg next to it and destroy it. Un-
under natural conditions they hatch in from 4 to 11 days. This is in accordance with a few experiments carried on during the season with eggs that were laid by females in captivity.

An attempt was made to find out the total number of eggs per tree laid by the Chrysopids and the results of several counts have shown numbers varying from 1 to 25. The peak of egg laying was during the first part of August, and at that time numbers of eggs varying from 3 to 8 were found for every hundred of peach moth eggs. No eggs could be found in the orchard after the last of September, although it is very possible that some were available at that time. **Larval Stage**—

It is not necessary to give in this paper a description of the chrysopid larva, since it has been described on several occasions by different writers. The larvae begin to feed shortly after having emerged from the egg shell, if food is available, and, although they are usually hungry at that time, they may remain between one and two days without food. A lot of newly hatched larvae were left 38 hours without food and the results were that 50 per cent of these died from starvation, the remainder were in good condition and fed and developed normally.

The duration of the larval stage varies between 14 and 28 days and their feeding period between 13 and 27 days. The full grown larva quits feeding about one day before it spins its cocoon; at that time it absorbs a large quantity of food and remains almost motionless until the spinning operation begins.

Several larvae were collected in the orchards during the summer and were reared in captivity in order to secure newly emerged adults for egg laying experiments. These larvae were generally found on the under surface of the peach leaves, although a few could be seen on the twigs and on the trunks of the trees. The activity of chrysopid larvae is rather limited and depends largely on the quantity of food available; if food is abundant they will absorb a large quantity at a time and then remain almost motionless until they are ready to absorb a new supply of food. In their advanced stages the larvae may live without food for as long as 6 days; this was observed in a few experiments carried out for that purpose. One single larva was still alive at the end of a period of 8 days, but died shortly after from starvation, on account of being too weak to absorb any food.

A series of experiments was also carried on to find out the total number of peach moth eggs devoured by chrysopid larvae. For this purpose three larvae of different ages were used, one being one day old, another 5 days old and the third one 10 days old. These, after starving for one day, were placed in a separate glass vial with a peach leaf containing from 20 to 25 peach moth eggs. During the period of ten minutes the one day old larva sucked 4 eggs, the 5 day old one 7 eggs and the 10 day old nine eggs. Twenty-four hours later all the eggs had been sucked with the exception of experiment no. 1, in which a few eggs remained untouched. In order to find out the approximate number of peach moth eggs required to feed chrysopids during their larval stage, the newly hatched larvae were allowed to feed on these eggs until they were ready to pupate. The results have shown that 620 eggs were used for one and 613 for another, making an average of 616.5 eggs per larva.
Similar experiments were carried on to find the number of peach moth larvae required during the larval feeding period of the chrysopids. In this case 3 newly hatched larvae were used and one new peach moth larva was fed to them every other day. From the time they began to feed until they were full grown 25 larvae were required or 8.3 larvae for each. The peach moth larvae used in this case were all full grown.

Observations in the orchards have shown that the chrysopid larvae were more abundant at the time the eggs of the second peach moth generation were at their peak. Counts which were made at different points at that time indicated that from 50 to 60 per cent of these peach moth eggs were sucked by the chrysopid larvae. Similar counts of the third generation indicated a decrease, the destruction being only 20 to 45 per cent.

A considerable number of peach moth eggs parasitized by *Trichogramma minutum* Riley were also destroyed by the chrysopid larvae, while on the other hand, this parasite destroyed many of the chrysopid eggs. A parasitism running from 5 to 12 per cent was noticed on several occasions.

It has been found impossible to determine the number of peach moth larvae destroyed by the chrysopids in the orchards and, although we have a very vague idea of this destruction, it can be stated that quite large numbers are destroyed when they migrate from twigs to fruit.

**Cocoons**—

The cocoons of chrysopids, in which they transform into adults, are of white silk and spherical in shape. They were found mostly on the under surface of the leaves, although several were found attached to infested twigs and fruit. This would indicate that oriental peach moth larvae were devoured while attempting to migrate from the twigs to the fruit or to enter into the fruit.

The duration of the pupal stage under natural conditions varies between 8 and 22 days. The matured pupae emerge from the cocoons through a circular opening at one end, a circular lid may be seen hanging on this opening by the means of a few threads. Different views have been published as to the exact manner in which this lid is cut so regularly by the matured pupa, but the process has not been observed by the writer.

**Adults**—

The adults are very well known to everybody. They are sometimes called Golden Eyes because of their shining golden yellow eyes; but they are more frequently called lace-wings on account of the delicacy and the beauty of their structure.

Very little study of this stage was made during the summer. Work was concentrated on collecting as many adults as possible in the orchards, with a view to getting eggs in quantity to study the larval stage more in detail. Wire screen cages, the same as the ones used for oriental peach moths, were used for securing oviposition. 10 adults, 5 males and 5 females, were placed in each cage with burdock leaves infested with black aphids, to allow them to feed and also obtain sufficient moisture. A peculiar feature was that very few eggs were laid on the leaves, most of them being deposited on the screen and the top of the cage which was of factory cotton.
Since the females were not reared in the laboratory, no strict record was kept as to the number of eggs laid. The only data available is a case where four females, which were taken from the orchard, deposited 130 eggs and only lived 12 days. These were probably old and had deposited some eggs before being taken into captivity.

CONCLUSION

While it would be difficult to give definite data as to the amount of control of oriental peach moth by the chrysopids this year, it may be stated that they have played an important part in conjunction with the parasites and other natural factors in the remarkable reduction in the peach moth infestation throughout the Niagara Peninsula this year.

THE BIOLOGY OF CANADIAN BARK-BEETLES *

THE SEASONAL HISTORY OF DENDROCTONUS RUFIPENNIS KY. IN NORTHERN ONTARIO.

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This bark-beetle is locally distributed over the forested areas of Quebec and Ontario, extending westward into Manitoba; in the United States, it has been recorded from Wisconsin and Michigan.

The insect has been found breeding in fallen white pine and jack pine, and, within recent years, has also been recorded from red pine.

The prevalence of the species is apparently governed to a certain extent by the amount of suitable breeding material available, though it seems to be absent from many localities where there is an abundance of pine culls and windfalls. The records of the species in Canada are not very numerous; it was observed in abundance in the Algoma district of Northern Ontario and specimens have been taken in Algonquin Park, Ont., near lake Kipawa, Que. and in the Riding Mountains, Man.

The adult beetle is slightly more than one quarter of an inch in length; the thorax is dark brown or black in colour and the elytra are dark red. It can be readily distinguished from Dendroctonus valens Lec., which is the only other species of the genus breeding in pine in Eastern Canada, by its slightly smaller size and dark thorax; in valens, the thorax and elytra are, as a rule, of a uniform brick-red colour.

In 1925, Dendroctonus rufipennis Ky., was taken in numbers near Frater in the Algoma district of Ontario where numerous colonies were found breeding in windthrown white pine and red pine.

Several cages were constructed for the purpose of studying this species, the insects being kept under close observation for a period of nearly three years. In addition to cage studies, logs of pine containing broods of this species were also watched carefully under natural conditions.

Flight takes place in the spring; if the weather conditions are favourable, emergence may occur towards the end of May, though there is rarely much activity until the first or second week of June. The entrance to the egg-tunnel is almost invariably located on the underside of the trunk when tunnels are cut in fallen timber. The tunnels are about seven or eight inches in length, slightly sinuate, and follow the grain of the wood.

*Contribution from the Division of Forest Insects, Entomological Branch, Department of Agriculture, Ottawa.
Bibliography of the Neuropterida

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