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NOTES ON THE FEEDING HABITS OF *HABROSYNE DERASA*, L. (LEPIDOPTERA)*

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The increase and spread of such introduced plants as blackberry (*Rubus fruticosus*, L.), ragwort (*Senecio jacobaea*, L.), St. John's wort (*Hypericum perforatum*, L.) and others, now constitute a menace to agriculture in certain parts of the Empire, notably Australia and New Zealand. This situation has led the Governments of those lands to investigate all possible means of control. Chemical and mechanical methods having proved either inefficient or uneconomical for the control of noxious weeds (Tillyard)[1] other lines of attack have been resorted to. The present conditions have resulted from a disturbance in the equilibrium of the natural flora brought about by the introduction of these plants, and the solution of the problem may rest in the readjustment of the 'balance' by the establishment, placed on a scientific basis, of certain elements of the fauna which assist in keeping these plants in check in their original environment. One of the most recent developments in economic entomology, therefore, has been the application of biological control to the problem of combating the spread of noxious weeds. This has involved the critical study of insects attacking weeds and, under the auspices of the Empire Marketing Board, the New Zealand Government and the Cawthron Institute, Nelson, research along these lines has been instigated. A short detail of this scheme has been mentioned elsewhere.[2]

The common blackberry or bramble (*Rubus fruticosus*) has proved the most rampant of introduced plants in New Zealand. According to Thompson,[3] though it was introduced at an earlier date, the first authentic record of its presence is 1864. So rapidly did it spread that in 1900 it was scheduled by the Government as a noxious weed. The extent of the infestation can be judged by a saying current on the west coast of South Island that they have only *one* blackberry bush and that is 200 miles long (Tillyard).[1]

Under the present scheme, therefore, insects which appreciably attack the blackberry are being specially considered and among the first to be studied was *Habrosyne derasa*, L. (Buff Arches Moth). *Habrosyne derasa* is too well known to need description here, and accounts of the insect will be found in the works of Barrett, Meyrick, South, Spuler, etc., in fact in practically all general works on Lepidoptera. The moth has a fairly wide geographical distribution and is recorded from Asia (West Central and Northern) and Central Europe. It is common in the British Isles, except in Scotland. Specimens, male and female, of *H. derasa* were taken by "sugaring" with molasses flavoured with amyl acetate, in Harpenden at about 10.30 p.m. on the nights of 6th, 8th, 9th and 10th July 1927. The environment was a wooded scrub hill, the scrub consisting chiefly of blackberry bushes. The moths were transferred to the Insectary at Rothamsted, encaged in a deep wooden barrel, closed above by muslin, with sprigs of blackberry in water and a sugar solution in order to supply them with nutriment.

Oviposition.

Eggs were first observed on the morning of 8th July. The position of the eggs upon the host-plant appears to be unique. They were deposited on the points of the serrated leaf-edge and on the tips of the spines. So persistent was this choice of a terminal position that in some instances a tier of eggs was observed projecting from the edge of the leaf. No previous reference to this habit of oviposition can be found, but it

* From the Entomology Dept., Rothamsted Experimental Station, Harpenden.

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is interesting to note that South[5] states, regarding the closely allied species *Thyatira batis*, L., "the fluted greenish-white eggs are laid upon the edges of the bramble leaves." He figures the eggs of *T. batis* on the blackberry leaf, and it would seem that they are not restricted to the mere points around the edge as is the case with those of *H. derasa*.

The eggs shortly after oviposition are easily detected owing to their whitish colour (they, like those of *batis*, are fluted longitudinally), but in a day or so this colour changes to a pinkish red and this, blending as it does with the tips of the thorns and leaves, renders detection difficult.

The incubation period averaged 16 days. After hatching the larvae crawled away, suspended themselves by silken threads from the underside of the leaf and remained in this position throughout the day. At dusk they returned to the leaf and commenced feeding.

Host-Plants.

The normal host-plant of the larvae of *H. derasa* is the blackberry. Barrett,[7] however, records the occasional presence of the larvae on hawthorn (*Crataegus oxycantha*, L.) and hazel (*Corylus avellana*, L.), and Theobald[8] includes this species under the heading "insects injurious to Raspberry (*Rubus idaeus*, L.)," but adds that it does no harm.

Feeding Tests on Economic Plants.

An insect to be of value in the biological control of noxious weeds must be specific in its feeding habits, or, at least, unable to attack any plant of economic importance. Hence it was necessary to discover whether larvae of *H. derasa* could feed and thrive on economic plants related to the blackberry. The plants used in these tests were: Blackberry (as control), loganberry, raspberry, rose, apple, cherry, plum, pear, and also currant.

The technique for these tests has been already described;[2] briefly, it consists of isolating the insects to be tested on sprigs of the tested plant and making daily observations and notes regarding their progress. In the present instance, ten larvae were placed in each experimental cage and the tests were duplicated. Approximately the same amount of leaf area was used in each cage. A stock of larvae was kept on blackberry and these were used in the second and third sets of experiments when they were ten and twenty days old respectively. The tests were carried out simultaneously and were commenced on 26th July.

Blackberry. The twenty newly hatched larvae placed upon the blackberry sprigs were found to have fed during the first night. Although damage to the leaves was witnessed it was not until 3rd August that actual perforation of the leaves had taken place. It was necessary to replenish the food on 8th August. Feeding continued until 1st September, when the larvae commenced to bury themselves beneath the peat moss at the bottom of the cage and prepared for pupation. All had pupated at the end of the experiment (9th September).

Loganberry. The twenty newly hatched larvae were placed on sprigs of loganberry and they fed the first night, actual perforation being observed on 28th July. Food was first replenished on 6th August. The larvae continued to feed and grow normally and rapidly and larvae of the same age fed on loganberry exceeded in size those fed on blackberry. Their ability to thrive on loganberry was emphasised by the fact that pupation occurred on the average two days earlier in the loganberry cages than in those containing blackberry (29th August–6th September.)

Raspberry. Twenty newly hatched larvae placed on sprigs of raspberry also fed during the first night and perforation of the leaves was observed on 28th July. Food

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was replenished on 8th August. Feeding and development were normal, and the larvae commenced pupation at the same time as did those in the blackberry cages. All larvae had pupated by 9th September.

Rose. Of the twenty newly hatched larvae on the sprigs of rose nineteen were dead on examination on 3rd August. The one larva alive appeared to be normal, but much smaller than those in the previous experiments; it, however, continued to feed slowly and finally pupated normally on 19th September.

A second series of experiments was set up on 3rd August, and in this ten larvae, 10 days old, having fed until then on the normal host (blackberry), were transferred to a sprig of rose. No damage was noted after the first night on their new host, but on 8th August, an appreciable portion of the rose had been eaten. The larvae continued to feed slowly until 17th September, when they entered the peat moss and pupated. Eight larvae pupated.

Apple. The twenty newly hatched larvae placed on apple would not settle and feed, although slight damage due to feeding was noticed on 1st August. On 5th August, however, all the larvae were dead.

A second experiment was set up on 5th August, when ten larvae, 10 days old, having previously fed on blackberry, were placed on a sprig of apple. These larvae fed upon their new host the first night. Feeding and development were slow and only four succeeded in pupating. These formed normal pupae.

Cherry. The twenty newly hatched larvae failed to survive on the cherry; all larvae being dead on 3rd August. The same day a further experiment was set up consisting of ten 10-day-old, blackberry-fed larvae on a sprig of cherry. These fed very slowly for a day or so, but on 20th August all were dead.

A further batch of ten 20-day-old, blackberry-fed larvae were placed on cherry on 26th August. Again slight feeding was detected but on 7th September all larvae were dead.

Plum. The twenty newly hatched larvae did not survive on plum, though slight damage to the leaves was evident. Ten 10-day-old, blackberry-fed larvae placed on plum on 8th August fed very slowly, and only four larvae were alive on 20th August. On 1st September one larva was alive, but this was dead on 15th September. No 20-day-old, blackberry-fed larvae were available for a further test.

Pear. The twenty newly hatched larvae did not survive on pear. Ten 10-day-old, blackberry-fed larvae commenced feeding on their new host-plant but all had died within 20 days after they had been placed on this plant.

Currant. Both newly hatched, and 10-day-old, blackberry-fed larvae failed to damage currant and soon succumbed.

Tests with a Choice of Food-Plants.

Two cages were set up containing sprigs of each of the above mentioned plants. Twenty newly hatched larvae were placed in each cage. On examination the following day the larvae were distributed among the sprigs of blackberry, loganberry and raspberry. Severe damage to these sprigs was apparent 5 days later. Similar results were obtained when older, blackberry-fed larvae were used. No evidence of attack on the other plants was secured.

Conclusions.

From the above experiments it is evident that the larvae of *Habrosyne derasa*, the normal host of which is the blackberry, will, under the conditions of these tests, feed equally well on loganberry and raspberry. Under conditions where a choice of these three plants is given they feed indiscriminately on them. Hence it appears

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undesirable that *derasa* larvae should be further considered from the point of view of the control of blackberry in New Zealand. This conclusion is further supported by the fact that under isolated conditions these larvae fed and attained the pupation stage on rose and apple, while, in addition, feeding actually took place on cherry, plum and pear.*

This work was carried out in the Entomological Department, Rothamsted Experimental Station, under the supervision of Dr. A. D. Imms, whom the writer wishes to thank for valuable advice and suggestions.

Summary.

1. Insect pests of the blackberry (*Rubus fruticosus*,L.) are being studied with a view to discovering insects likely to assist in the biological control of this noxious plant in New Zealand. *Habrosyne derasa*, L., was the first species brought under observation.

2. Investigations revealed an apparently unique method of oviposition, the eggs of *H. derasa* being deposited on the points of the serrated leaf-edges of the blackberry.

3. Newly hatched larvae of this moth have been simultaneously tested as to their ability to feed and thrive on the following plants :—Blackberry (normal host), loganberry, raspberry, rose, apple, cherry, plum, pear, and currant. They thrived equally well on the first three plants. Ten-day-old, blackberry-fed larvae, when transferred to rose and apple, fed and some ultimately pupated. Similar larvae transferred to cherry, plum and pear fed sparingly but did not succeed in pupating.

4. When a choice of food-plants was given, feeding was concentrated on blackberry, loganberry and raspberry.

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* W. J. Cross (Entom. Record ii, 1891, p. 67) records having taken larvae of *H. derasa* feeding wild upon *Spiraea ulmaria*.

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