How far can you go caterpillar? Observations on *Uresiphita maorialis* (Felder) (Lepidoptera: Crambidae) larvae crawling away from their host plants in an urban setting

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Abstract

Between October 2007 and March 2008, I carried out field observations and a semi-controlled pilot experiment to become familiar with the biological and phenological aspects of *U. maorialis*. In my observations, I noticed that *U. maorialis* last instar larvae tend to abandon their host plants before pupating, and, thus, it is common to see larvae crawling away from their host plants. I was interested in knowing how far from its host plant a larva could go before pupating. To that end, I carried out measures in controlled and semi-controlled conditions to evaluate the distance to which a larva could move away from its host plant to pupate. My observations indicate that larvae can move a wide range of distances, from a few centimetres to several meters, away from their host plants.

Key words: Wellington gardens, kowhai moth, egg clusters.

Introduction

Uresiphita maorialis (Felder), also known as the kowhai moth, is a Lepidoptera species of the family Crambidae known to feed on quinolizidine alkaloid-bearing plants (Leen 1997). During summer (February 2008), I observed last instar individuals of *U. maorialis* larvae climbing walls and moving away from their host plants in gardens of Wellington city. In one particular case, all the larvae seemed to come from a single heavily infested *Sophora molloyi* tree occurring in a garden located in the Kelburn neighbourhood. As many larvae became quite conspicuous when crawling across the pavement and on clear coloured

walls, I decided to measure how far from their host plant a last instar caterpillar would go before entering the pupa stage.

In order to carry out the observations, I marked two heavily infested *S. molloyi* plants occurring in two gardens of the Kelburn neighbourhood in Wellington. Plants were chosen for being isolated (more than 20 meters away) from other potential hosts (e.g. *Sophora* spp. plants, gorse, lupin) that could serve as shelters for the larvae. I visited both trees on the last week of February (2008), when the second generation of larvae would be about to enter the pupation stage (Mundaca 2012). I located as many last instar larvae as I could find that; 1: showed signs of entering the pupation stage (body slightly engrossed, immobility), 2: had already commenced the pupation stage (profusion of silk threads around the body, first signs of the cocoon), and 3: had already fully entered the pupation stage.

With a measuring tape, I recorded the distance that the larvae had managed to move from each *S. molloyi* host plant. Simultaneously, I kept 35 last instar larvae, collected from infested *S. microphylla* trees, on two *S. microphylla* potted plants in a temperature-controlled room at a Victoria University of Wellington facility. Twenty last instar larvae were put on the first potted plant. One week later another fifteen larvae were put on the second potted plant. Plants were foliated enough to ensure food availability for the larvae to not only avoid starvation, but also prevent the larvae from leaving the plant because of the lack of food. I covered the base of the potted plants with conic pieces of cardboard to allow the larvae to leave the potted plant and crawl away freely. After 5 days on each plant, five larvae died (two in the first plant and three in the second plant) for unknown reasons.

For the first *S. molloyi* plant I recorded larvae pupating at distances ranging from 3 to 740cm from the host (n=17) (**Figure 1A**). For the second plant I recorded larvae pupating at distances ranging from 3-891cm (n=15), with a particular larva found to be pupating 891 cm away, and with three other larvae pupating at distances ranging between 7 to 8 meters from the host plant **(Figure 1B)**.

In the laboratory experiment, thirty larvae placed on *S, microphylla* were found to abandon their host plant and enter the pupation stage. For the first

plant, I recorded larvae pupating at distances ranging from 0-402 cm (n=17), with a maximum distance recorded of 402cm from the host plant, and only two larvae pupating at more than 3 meters from the host plant **(Figure 1C).** For the second *S. microphylla* plant, the larvae managed to move away and pupate at distances ranging from 2-233cm (n=13). The maximum-recorded distance was only 233cm **(Figure 1D).**

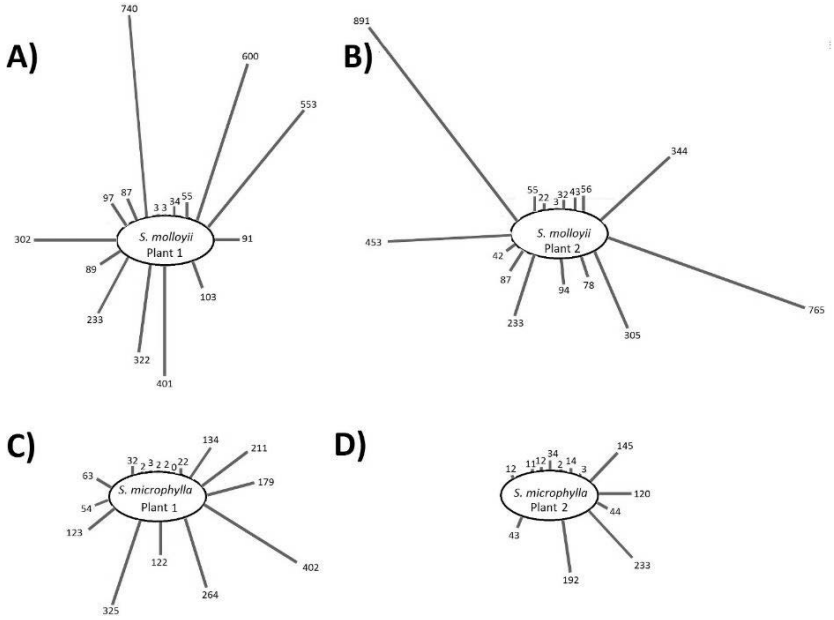

Figure 1. Diagram showing distances (*) where larvae were observed pupating for each host plant of both species: **A,B)** *S. molloyi* and **C,D)** *S. microphylla*. Distances from host plant are shown in cm.

(*) Diagrams do not necessarily reflect the exact position of each larva from its host plant, as they were arranged to show a better perspective of dispersion distances.

In general, larvae kept on *S. microphylla* potted plants managed to disperse shorter distances than those observed in the garden plants (**Figure 2**). Although the number of observations was limited, I initially expected the

larvae in the gardens to disperse less distance from their host plants. My assumptions were based on the fact that many larvae seem to search for shelter before pupating. The more heterogeneous habitat surrounding *S. molloyi* plants was then expected to be more suitable in providing pupation shelters, such as litter, stones, cracks or other plants. Considering the fact that observations on *S. molloyi* were carried out in non-controlled conditions, the distances recorded for some larvae (particularly those greater than 5 meters) should be taken with reserve, as some of those larvae could, for example, have come from another source and not from the studied host plant. Although this possibility needs to be taken into consideration, it seems unlikely that this was the case in these observations since no other *Sophora* plant was located near the observed plants. Furthermore, the controlled experiment showed that larvae rarely disperse more than 4 meters from their host plants when entering the pupation stage
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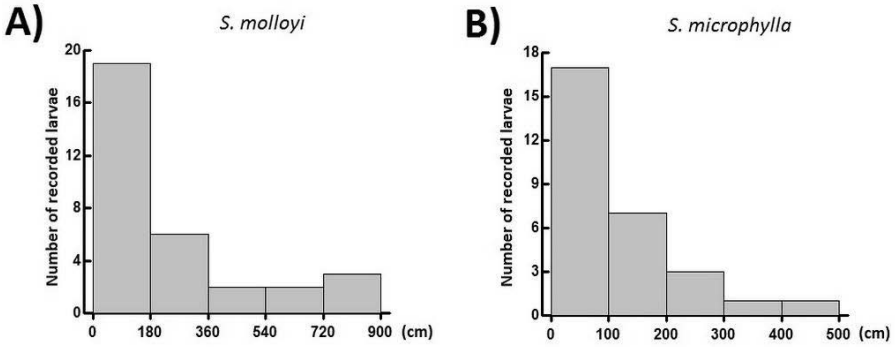

Figure 2. Frequency histograms showing the distribution of distances recorded for larvae dispersing from two individual plants of *S. microphylla* (A, n=30), and two plants of *S. molloyi* (B, n=32) before pupating.

Many immature instars of Lepidoptera are known to disperse from their host plants in early instars (e.g. Varela & Bernays 1987) and to abandon their host plants before pupation (Kakimoto et al. 2003; Kingsolver et al. 2011). The mechanisms that drive such behaviour, however, are not completely understood and have been attributed to different strategies, such as avoiding high larvae densities (Kakimoto et al. 2003), finding appropriate pupation sites (Rausher 1979; Kingsolver et al. 2011), finding

new host plants (Bernays 1995), entering diapause (Rutowski et al. 1987) or a dispersing mechanism (Zalucki et al. 2002). In the case of *U. maorialis*, I have observed that even earlier instars (3^{th} and 4^{th}) have the capacity to abandon their host plants when they run out of edible foliage, in which case they remain near the host plant to return to it after one week of presumably searching for food elsewhere. This behaviour allows the plant to regenerate part of its lost foliage. Whether larvae found shelter in another kowhai plant or in an alternative host, and how they manage to survive while the host plant is regenerating its foliage is still unknown.
In terms of the dispersion, finding an appropriate pupation site could be a key to explaining such behaviour. Observations carried out in urban gardens showed that larvae climbing clearly coloured walls become quite conspicuous to predators, especially to sparrows (Mundaca 2012). This may indicate that finding a suitable place to pupate could be difficult and risky, and potentially take longer than, for instance, in a natural environment, and that many of the recorded larvae simply entered the pupating phase before reaching a suitable place to pupate.

The observed distances described in this short communication are the first of its kind so far for *U. maorialis*, and could provide interesting clues to understand the mechanisms of larval dispersion of this species. These observations could help, for example, to manage distances between kowhai plants in parks and gardens in order to minimise infestation by the kowhai moth.

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