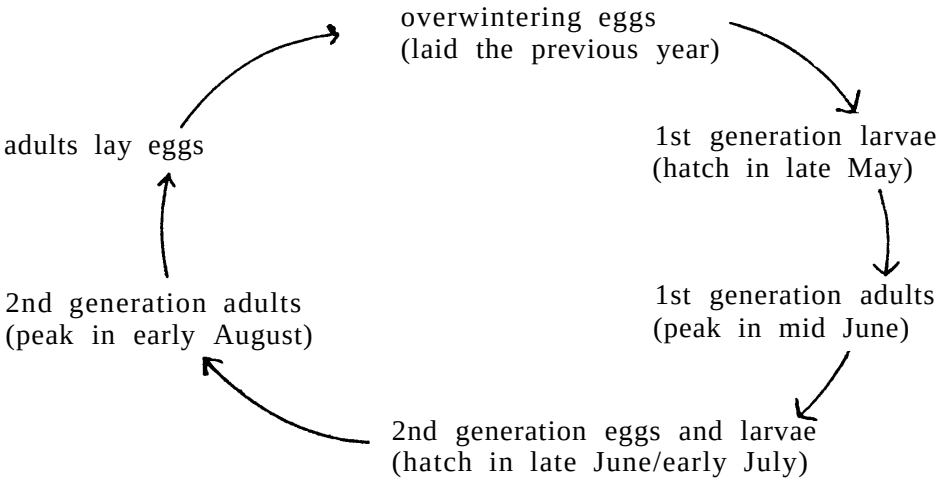
# MONITORING METHODS FOR BLACKHEADED FIREWORM IN RELATIONSHIP TO PHEROMONE TRAP COUNTS: RESEARCH RESULTS AND THEIR APPLICATIONS TO SAMPLING

Pheromone baited traps were used to monitor blackheaded fireworm adults. One trap was placed every ten scouted acres, with most marshes containing two traps. Pheromone baits (which attract male moths only) were replaced every three weeks. Trap catches were counted weekly. Each week, beds were swept with an insect sweep net and observations for larval presence and damage were made. Beds were swept seventy-five to one hundred times, depending on bed size.

## Adult Trap Counts

There are two main peak flight periods for blackheaded fireworm in central Wisconsin; mid June and early August (Figure 1). Ninety-five percent of the time the first generation trap counts are larger than the second. Eighty percent of the time there is a correlation between the size of the first and the second generation trap counts. In an untreated situation the correlation is most likely higher.

Figure 1. Blackheaded Fireworm Life Cycle.




## Adult Trap Counts and Larval Frequency

The relationship between adult trap counts and the frequency of larval detection is influenced by the time of year, pesticide applications, scouting techniques and the environmental conditions. Because of these factors it is difficult to predict the exact number of larvae that will be collected based on trap counts. The larval data used in this study were collected by relative methods (sweep net and observation), rather than using an absolute method. Marshes were treated with insecticides.

Observations play an important role in cranberry IPM. Many cranberry insects such as blackheaded fireworm have highly aggregated populations, and it is not uncommon for growers to have “hot spots”. Because the distribution pattern and larval size affects how precise sweeping is, larvae are observed more frequently than swept during certain time periods.

## Between-Year Larval and Adult Relationships

There is a seventy percent correlation between second generation trap counts and the following year's first generation larval levels. If second generation trap counts exceed five adults, larvae are fifteen times (77 vs. 5 percent of the marshes) more likely to be collected in the sweepnet and are three times (100 vs. 29 percent) more likely to be observed by IPM scouts the following spring, than if the adult level is five or below. This is critical information for growers who have high second generation adult trap counts because it may indicate the potential for a high first generation larval level the following year. Sixty percent of the growers have second generation trap counts of five or below.

## Within-Year Larval and Adult Relationships

First generation adults and second generation larvae. First generation trap counts can be used to predict the probability of collecting second generation larvae. When the first generation peak adult trap count is five or less (twenty-eight percent of the total marshes), scouts are unlikely to collect larvae through sweeping or observation (Table 2). Larvae will not be collected through sweeping unless the adult peak is over twenty-five. Larvae at low populations will be detected more readily through observations than through sweeping.

Table 2. Percentages of marshes in which second generation larvae were collected in late June/early July in relation to the previous first generation adult levels.

| Peak No. of Adults | Sampling Method: Sweepnet | | | | Observed | | | |
|---|---|---|---|---|---|---|---|---|
| | Not Found | | Found | | Not Found | | Found | |
| | No. | % | No. | % | No. | % | No. | % |
| 0-5 | 19 | 100 | 0 | 0 | 19 | 100 | 0 | 0 |
| 6-25 | 18 | 100 | 0 | 0 | 13 | 72 | 5 | 28 |
| 26-55 | 5 | 62 | 3 | 38 | 4 | 50 | 4 | 50 |
| over 55 | 13 | 56 | 10 | 44 | 6 | 26 | 17 | 74 |

First generation larvae and adults. First generation eggs hatch into larvae in late May. The larvae pupate and give rise to first generation adults. If no first generation larvae are collected in the sweepnet, the following first generation peak trap counts are unlikely to exceed twenty-five adults. (Table 3). Larvae were observed at fifty percent of the marshes when the resulting adult trap counts are between six and twenty five adults. Larvae were readily collected in the sweepnet or through observation, when the following trap counts exceed fifty-five.

Table 3. Percentage of marshes in which first generation larvae were collected and the resulting peak adult levels.

| Peak No. of Adults | Sampling Method: Sweepnet Not Found No. | % | Sweepnet Found No. | % | Observed Not Found No. | % | Observed Found No. | % |
|---|---|---|---|---|---|---|---|---|
| 0-5 | 18 | 95 | 1 | 5 | 17 | 89 | 2 | 11 |
| 6-25 | 18 | 100 | 0 | 0 | 9 | 50 | 9 | 50 |
| 26-55 | 6 | 75 | 2 | 25 | 3 | 38 | 5 | 62 |
| over 55 | 7 | 0 | 16 | 70 | 1 | 4 | 22 | 96 |

Second generation larvae and adults. Second generation larvae peak in late June/early July, pupate, and develop into second generation adults. Second generation larvae were rarely collected from marshes whose ensuing second generation trap counts were below five adults (Table 4). There was a fifty percent chance of finding larvae by sweeping, when the following adult trap counts was between six and twenty-five. This is substantially different than the first generation (no larvae collected) (Tables 3 and 4). Larvae were swept at all marshes when the following adult peak was over fifty-five adults, compared to seventy percent in the first generation.

Table 4. Percentages of marshes in which second generation larvae were collected and the resulting peak adult levels.

| Peak No. of Adults | Collection Method: Sweepnet Not Found No. | % | Sweepnet Found No. | % | Observed Not Found No. | % | Observed Found No. | % |
|---|---|---|---|---|---|---|---|---|
| o-5 | 43 | 98 | 1 | 2 | 34 | 77 | 10 | 23 |
| 6-25 | 9 | 50 | 9 | 50 | 5 | 28 | 13 | 72 |
| 25-55 | 4 | 57 | 2 | 43 | 1 | 17 | 5 | 83 |
| over 55 | 0 | 0 | 4 | 100 | 0 | 0 | 4 | 100 |

## Conclusion

First generation trap counts can be used to predict the probability of collecting second generation larvae. Second generation trap counts can be used to estimate the following year's first generation larval level and frequency. Also, the probability of collecting larvae is reflected in the subsequent trap counts. Additional research needs to be conducted to determine if trap counts can accurately predict larval levels.

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