



Introducing a new arrival to the Arboretum: the seed predator *Apion rostrum*

Amy O. Alstad
Carleton College, Northfield MN



Introduction

Most plants face significant seed mortality, and often, pre-dispersal seed predators are an important source of this mortality (Petersen and Sleboda 1994).

This study focuses on a prairie legume, *Baptisia lactea*. *B. lactea* suffers relatively little vegetative herbivory, due to high concentrations of alkaloid defense compounds (Petersen and Sleboda 1994). However, *B. lactea* suffers seed mortality rates of up to 98%, primarily from a pre-dispersal seed predator, the weevil *Apion rostrum* (Curculionidae) (Haddock and Chapin 1982).

The presence of *A. rostrum* was first documented in the Carleton Arboretum (the Arb) in the summer of 2008. Here, I provide the initial abundance and distribution data for this native seed predator in the Arb.



Figure 1. Adult and larval stages of the *Baptisia* weevil *Apion rostrum*

Figure 2. *B. lactea* seed pods with and without weevils present.

Species Background

Apion rostrum is a native member of the Curculionidae family (Fig. 1). At the beginning of the summer, adult females bore holes in the base of *B. lactea* flowers, and lay several eggs in the developing ovary. The larvae feed upon the maturing seeds (Haddock and Chapin 1982).

Predated seed pods are identifiable by a lack of seeds and an abundance of frass (Fig. 2). To emerge, adult weevils may bore a hole through the seed pod wall, or wait for the seed pod to dehisce in autumn (Haddock and Chapin 1982).



Figure 3. Seed-bearing *B. lactea* in the Carleton Arboretum.

Methods

Study Site- This study was conducted in the restored prairie of Carleton College's Cowling Arboretum (Fig. 3). Age of prairie plantings range from 1 to 13 years old.

Data Collection- Data were collected in August, 2008. At each of 156 evenly distributed permanent plots (Fig. 4), the closest three *B. lactea* plants were sampled. Three pods were taken from each plant; one from the top, middle and bottom of the seed stalk. Number of *A. rostrum* found in each pod were recorded.

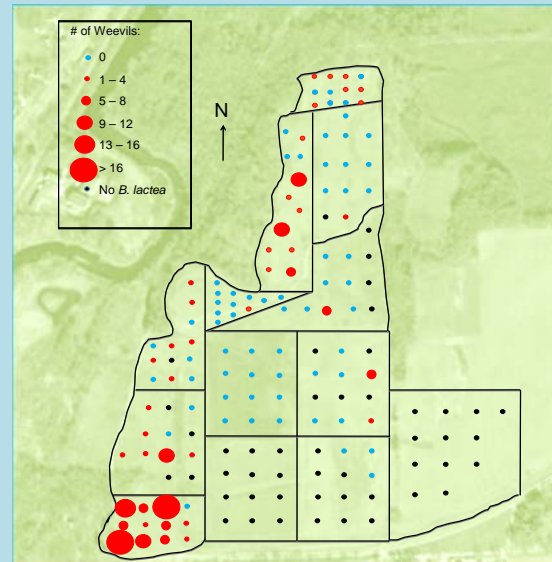


Figure 4. Distribution and abundance of *A. rostrum* in the Carleton Arboretum. Lines designate restoration fields of different ages. Each point represents a plot where nine *B. lactea* seed pods were sampled from three individual plants. Point size indicates the number of weevils found at each plot.

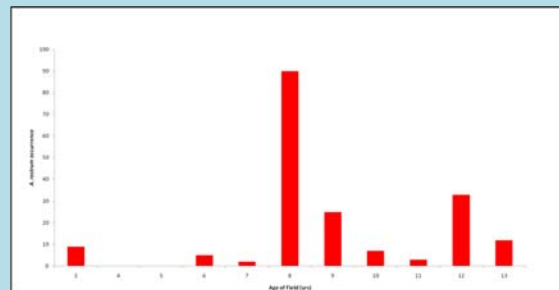


Figure 5. Highly variable relationship between *A. rostrum* density and age of field restoration. Age of field is measured in number of growing seasons since the field was restored. *A. rostrum* occurrence is the sum

Results

26.7% of the 299 *B. lactea* plants sampled in the arb were infested with *A. rostrum*. These infested plants had on average 1.46 *A. rostrum* in each seed pod (Fig. 4)

The *A. rostrum* in the Arboretum is highly non-random ($\chi^2 = 329.96, P < 0.0001$) (Fig. 5). *B. lactea* density and location of the pod on the stalk had no discernable impacts on *A. rostrum* distribution. Fields six or more years old tended to contain higher densities of *A. rostrum* ($t=1.5$, one-tailed $P = 0.084$), but there was not a linear relationship between field age and weevil density.

Discussion

A population of *A. rostrum* has recently established itself in the Carleton's Arboretum. Prior to this summer, this species had not been documented in the Arboretum (McKone, pers. com, 2008).

The presence of *A. rostrum* in the Arboretum's prairies is a mixed blessing. It does indicate that our restoration is successfully maturing, as members of the native faunal assemblage return. However, *A. rostrum* is a thorough seed predator, and is known to impose high rates of mortality among *Baptisia*. As a result, the establishment of this native seed predator has the potential to greatly reduce the reproductive fitness of *Baptisia*. The impacts of decreased seed production may be negligible, at least initially, since *Baptisia* is a long-lived prairie species and well-established in the Arb.

Personal observations made in prairie restorations where *A. rostrum* were more abundant suggest that an extremely small percentage of *Baptisia* seeds successfully mature when these seed predators become established.

Future Study

Several avenues of further research are suggested by the findings of this preliminary study:

- What is the dispersal ability of *A. rostrum*?
- Is there an edge effect with respect to *A. rostrum* density?
- What proportion of the *Baptisia* seed crop is being lost each year?