A Native Hymenopteran Predator of *Agonopterix Alstroemeriana* (Lepidoptera: Oecophoridae) in East-Central Illinois

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A NATIVE HYMENOPTERAN PREDATOR OF 
AGONOPTERIX ALSTROEMERIANA (LEPIDOPTERA: OECOPHORIDAE) 
IN EAST-CENTRAL ILLINOIS

Duane D. McKenna, Arthur R. Zangerl and May R. Berenbaum

ABSTRACT

Agonopterix alstroemeriana is a European oecophorid moth that defoliates poison hemlock (Conium maculatum), a noxious Eurasian weed extensively naturalized throughout temperate Australia, New Zealand, North America, and South America. Throughout western North America, and increasingly in the Midwest and Northeast, A. alstroemeriana has been utilized in poison hemlock eradication programs. We report, for the first time, predation on A. alstroemeriana by Euodynerus foraminatus (Hymenoptera: Eumenidae), a native solitary wasp that paralyzes these and other lepidopteran larvae and uses them to provision its nests. The presence of an effective predator may reduce the impact of A. alstroemeriana in biological control programs.

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Table 1. Number of nests with A. alstroemeriana larvae and number of larvae (if known) found in each nest. In 1998, trapping began in March and ended in September. In 1999, trapping began in June and ended in September. The data reported for the year 2000 includes only April–July.

<table>
<thead>
<tr>
<th>Year of collection</th>
<th># nests with A. alstroemeriana</th>
<th># A. alstroemeriana in nests*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>3</td>
<td>8, 12, 28</td>
</tr>
<tr>
<td>1999</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>7</td>
<td>1, 3, 3, 51, 17, 12, 28</td>
</tr>
</tbody>
</table>

*Numbers are approximate because dead larvae often were decaying or otherwise disfigured, and were commonly broken apart when we dissected the nest.

grams in other states (Biological Control of Weeds, Inc., http://www.biocontrol.com/7j.html [Accessed 10 July 2000]).

Although A. alstroemeriana is introduced, many native congeners can be found throughout its range (Hodges 1974). The possibility exists that predators of other Agonopterix species have shifted to preying upon A. alstroemeriana where it has been introduced, reducing the efficacy of biological control of poison hemlock by A. alstroemeriana in those areas.

MATERIALS AND METHODS

We conducted annual surveys of A. alstroemeriana from 1997 to 2000 on four local populations of Conium maculatum located in and around Urbana (Champaign County, IL); at one additional site, we set out traps for holonesting wasps, in order to determine rates of predation on this species. The four populations were the “yard waste” population, located in Urbana on what was previously a landfill (the site is currently used for landscape waste recycling); the “Route 150” population, located approximately 3.5 km east of the eastern city limit of Urbana on Route 150 and within the Penn Central railroad right-of-way; the “ditch” site, located approximately 0.5 km west of Lincoln Avenue along a drainage ditch that intersects Windsor Road; and the “railroad” population, located in the Penn Central right-of-way approximately 0.3 km west of Interstate 57. Each spring in mid-May, 50 plants at each site were selected haphazardly and scored for the number of A. alstroemeriana larvae present.

Wasp nest traps were placed at our site at the University of Illinois Phillips Tract (1.6 km N. of Route 150 on Cottonwood Rd., Champaign County, IL). Trap nests consisted of 20 by 40 by 180 mm blocks of pine with a 1 cm hole drilled lengthwise into them to a depth of 70–80 mm. The nests are designed to attract wasp species that partition natural cavities and provision their grubs with prey (Krombein 1967). Bundles of 4–6 “traps” were placed on 1.5 m metal poles in an old field overgrown with alien grasses, parsnip (Pastinaca sativa), blackberries (Rubus spp.), Canada thistle (Cirsium arvense), clovers (mostly Melilotus sp.) and other plants typical of such habitats. The site is adjacent to a prairie reconstruction and remnant dry-mesic forest. Several traps were also placed on mulberry limbs (Morus alba) in a neighboring fencerow.
Figure 1. Number of larvae collected from a haphazard sample of 50 plants at each of four sites in Champaign County, IL from 1997 through 2000.

The bundles of trap nests were examined once weekly during the period March–September 1998, June–September 1999, and April–July 2000 for partitioned nests. Provisioned and sealed nests (nests with a thin mud seal at the entrance to the nest hole) were collected and split open in the laboratory to reveal their contents.

RESULTS

In each of the four census years, the amount of damage observed on C. maculatum plants in these populations was minimal, and there was no obvious increase in the insect populations over the survey period (Fig. 1). One factor that may be limiting A. alstroemeriana populations in central Illinois is predation.

We recovered more than 100 larvae and prepupae of A. alstroemeriana from wasp nest traps at our site at the University of Illinois Phillips Tract. Most nests contained from one to eight partitioned compartments of approximately 1 cm length, each separated from the next by a thin brown to white mud barrier. Typically, within each partition we found a single wasp larva and from 3 to 10 paralyzed microlepidopteran larvae or prepupae. Most compartments contained only one species of larva, as did most nests. The first nests were found partitioned in mid-May 1998, early June 1999 (trapping did not begin until June of 1999), and early May 2000. The nests collected in May 1998 and late May and early June 2000 contained large numbers of A. alstroemeriana; in fact, more A. alstroemeriana were collected in trap nests over the course of the study than any other species of Lepidoptera. In some nests A. alstroemeriana was found in only one compartment, and only one to a few individuals were in the nest, but in other nests the entirety of the nest was provisioned with A. alstroemeriana. One nest collected 7 June 2000 con-
tained 51 larval and prepupal *A. alstroemeriana*. This was not unusual as other nests collected in 1998 and 2000 contained as many as 28 *A. alstroemeriana*, and no other species of larvae. In several of these nests we found large wasp larvae surrounded by dead, emaciated *A. alstroemeriana*. In May and June of 1998, one of each of the nests found to contain *A. alstroemeriana* was collected in the early morning (ca. 0800 h), at which time the female wasp partitioning the nest had not yet left the nest to begin foraging. These females were identified by Richard Cowan (Western Michigan University) as *Euodynerus foraminatus* (Saussure) (Hymenoptera: Eumenidae). It appears that this wasp was also responsible for the other nests collected because, in three years of collecting trap nests and attempting to capture adult wasps partitioning the nests, no other wasp species was collected or observed making nests with mud-partitioned cells, each with a single wasp larva and multiple lepidopteran larvae. In fact, the only other wasp species observed or collected that used the trap nests made a very different nest without partitions and provided its larvae with tree crickets, which were not identified to species. The nest entrance for this species was sealed with dry grass fibers. Nests of this wasp species were collected only in 1998.

Despite the abundance of *A. alstroemeriana* found in nests of *E. foraminatus*, relatively few poison hemlock plants were found growing nearby. The closest plants were more than 50 m away along a roadside. Very few *A. alstroemeriana* leaf rolls have been observed at this site to date. The extraordinary efficiency with which *E. foraminatus* found and captured *A. alstroemeriana* suggests a specialized hunting mode. Consistent with this suggestion is the fact that *Agonopterix clemensella* (Chambers), a native congener, was found in two nests. Also discovered in wasp traps were other leaf-rolling lepidopterans, including *Dichomeris flavocostella* (Clemens) (Gelechiidae), *Sparganothis sp.* (Tortricidae), and fewer than 10 individuals of other unidentified lepidopteran larvae.

Surprisingly, we found no *Depressaria pastinacella* (Oecophoridae) larvae in the trap nests despite the relative abundance of *D. pastinacella* larvae in the field where the traps were located, and despite a report by D. Cowan (WMU) of finding *D. pastinacella* in trap nests in Michigan (pers. comm.).

Because more *A. alstroemeriana* were found in trap nests partitioned by *E. foraminatus* than any other microlepidopteran, the nesting behavior of *E. foraminatus* has important implications for poison hemlock eradication programs and *A. alstroemeriana* populations in the Midwest.

ACKNOWLEDGMENTS

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