Occurrence of *Diabrotica Undecimpunctata Howardi* Barber (Coleoptera: Chrysomelidae) Feeding on *Cirsium Pitcheri* Flowers

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Occurrence of *Diabrotica undecimpunctata howardi* Barber (Coleoptera: Chrysomelidae) feeding on *Cirsium pitcheri* flowers

Jordan M. Marshall

*Diabrotica undecimpunctata howardi* Barber (adult = spotted cucumber beetle, immature = southern corn rootworm, Coleoptera: Chrysomelidae) is a polyphagous pest found on a broad range for agricultural plants (Krysan 1986). The larvae are root feeders commonly found on plants in the families Cucurbiaceae (gourds and squashes), Poaceae (grasses, including *Zea mays* L.), and Fabaceae (legumes, including *Medicago sativa* L.), and can have significant impact on the crop yield depending on the agricultural system (Campbell and Emery 1967, Brust and House 1990). As an adult, *D. u. howardi* is among the most commonly encountered insects on gourd species (*Cucurbita* spp. and *Lagenaria* spp.) (Fronk and Slater 1956). Foliar damage by *D. u. howardi* can result in significant reduction in crop yield and floral damage includes feeding on anthers and filaments, reducing subsequent pollen production (Brewer et al. 1987, Sasu et al. 2010).

*Cirsium pitcheri* (Torr. ex Eaton) Torr. and A. Gray (Pitcher’s thistle, Asteraceae) is a federally threatened plant species found in open sand dune ecosystems ranging along Lakes Huron, Michigan, and Superior (Voss 1996, Higman and Penskar 1999). *C. pitcheri* is a monocarpic species (senescing after a single flowering event) with an extended time period between seedling establishment and flowering (5-8 years) (US Fish and Wildlife Service 2002). While habitat protection, which has been implemented in numerous locations within the range of *C. pitcheri*, is essential for population safety, without adequate reproduction populations will not be maintained or grow. The combination of pollinator efficiency and animal seed predation has significant impact on the final seed crop for a population of *C. pitcheri* (Loveless 1984).

On 21 and 22 May 2012, I conducted a survey of insect visitors to *C. pitcheri* individuals in Indiana Dunes National Lakeshore (IDNL) and Indiana Dunes State Park (IDSP). I identified 20 individual *C. pitcheri* plants (10 in IDNL and 10 in IDSP), observed each plant for 10 minute observation periods on both survey days, and identified floral visitors to family (Table 1). Due to the rarity of *C. pitcheri*, the selection protocol was not random and those selected for observation included all flowering plants I encountered through a stochastic search of IDNL and IDSP. A subsequent grid survey at both parks (20 m² circular plots at 50 m spacing with 1 m wide belt transects between plots) resulted in only one additional flowering *C. pitcheri* individual at IDNL, which was not included in the observations. *C. pitcheri* plants observed at IDNL were 40.2 m apart (SD 3.6) and those at IDSP were 134.9 m apart (SD 12.3). I found one occurrence of *D. u. howardi* at IDNL. At IDSP, I observed ten *D. u. howardi* individuals feeding on five separate *C. pitcheri* plants (Fig. 1). Two plants had three individuals feeding while another had two individuals feeding. Those *C. pitcheri* plants with observed *D. u. howardi* individuals were 100.2 m apart (SD 22.5), with the closest two plants only 1.8 m from each other and with only one occurrence each of *D. u. howardi*. Those individuals observed were adults that had overwintered and likely were in a time period of active feeding and mating (Krysan 1986).

While *D. u. howardi* is often characterized as an agricultural pest, especially on Cucurbiaceae species, adults do feed on a wide range of other plants.

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Table 1. Insect families observed visiting *Cirsium pitcheri* flowers in Indiana Dunes National Lakeshore (IDNL) and Indiana Dunes State Park (IDSP), including numbers of plants observed visited by a family and individuals in a family observed.

<table>
<thead>
<tr>
<th>Family</th>
<th>IDNL Plants</th>
<th>IDNL Visits</th>
<th>IDSP Plants</th>
<th>IDSP Visits</th>
</tr>
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<tbody>
<tr>
<td><strong>Coleoptera</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chrysomelidae</td>
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<td>1</td>
<td>6</td>
<td>7</td>
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<td>2</td>
<td>4</td>
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<td><strong>Diptera</strong></td>
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<td></td>
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<tr>
<td>Calliphoridae</td>
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<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
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<td>4</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
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<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Cecidomyiidae</td>
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<td>11</td>
<td>4</td>
<td>10</td>
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<tr>
<td><strong>Hymenoptera</strong></td>
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<tr>
<td>Halictidae</td>
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<td>0</td>
<td>8</td>
<td>15</td>
</tr>
</tbody>
</table>

1Excludes *Diabrotica undecimpunctata howardi*.

Figure 1. Example of *Diabrotica undecimpunctata howardi* feeding (circled) in a *Cirsium pitcheri* flower at Indiana Dunes State Park.
including numerous species in Asteraceae. Powell et al. (1996) found *D. u. howardi* commonly in musk thistle flowers (*Carduus nutans* L., Asteraceae). It has been observed feeding on the leaves of *Solidago canadensis* L. and *S. fistulosa* Miller (Asteraceae) (Fontes et al. 1994). Campbell and Meinke (2006) also found *D. u. howardi* feeding on the flowers of ten different Asteraceae species, including a *Cirsium* species. However, reductions in pollen production due to adult *D. u. howardi* floral feeding in non-agricultural species have not been quantified.

Invasive species management is important to improving pollination success for *C. pitcheri* (Baskett et al. 2011). However, other aspects of habitat protection for *C. pitcheri* may limit *D. u. howardi* impacts. Snyder and Wise (2000) demonstrated that *D. u. howardi* exhibited reduced feeding as an antipredator behavior in the presence of a wolf spider, *Hogna helluo* (Walckenaer) (Araneae: Lycosidae). As a common early successional species, *H. helluo* may benefit from conservation biological control practices resulting from habitat protection for *C. pitcheri* in sand dune ecosystems due to the simplicity of the vegetative structure and regular disturbance (Marshall and Rypstra 1999). There is a need to identify if *D. u. howardi* larvae feed on *C. pitcheri* roots. However, due to low soil moisture content within dune soils, like those found at IDNL and IDSP, egg survival and larval development may be adequately hindered (Lummus et al. 1983, Brust and House 1990). While survival of immature *D. u. howardi* potentially could be limited in *C. pitcheri* habitat, adult migration may be continuous from source populations in local agricultural fields (Lawrence and Bach 1989). Feeding impacts by *D. u. howardi* on *C. pitcheri* flowering, pollination, and seed development may be important and need to be quantified.

Acknowledgments

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