Biological Control of *Lycorma*

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Surveys in the PA infestation zone

• Egg parasitoid wasp discovered in surveys of PA quarantine zone by HP Liu
• Reported to parasitize ca. 7 % egg masses and 20% eggs within discovered masses. Found only at certain sites.
  • (Liu & Mottern 2017. J. Insect Science)
• Native to Asia (introduced against gypsy moth)
  • Not reported from Lycorma in China

*Ooencyrtus kuvanae*
(Hym: Encyrtidae)
Anastatus orientalis
(Hym.: Eupelmidae)

• Discovered in northern China in 2011
• Egg parasitoid of Lycorma
• Reported to parasitize 30% egg masses and 40% eggs within discovered masses
  • (Yang et al. 2015)
• In quarantine culture at APHIS (Otis, MA) for further study
Life Cycles of Lycorma and Anastatus are seasonally synchronized.

<table>
<thead>
<tr>
<th>A. orientalis adults</th>
<th>Overwintering diapause</th>
<th>Summer diapause</th>
<th>Overwintering diapause</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. orientalis in diapause</td>
<td></td>
<td></td>
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<tr>
<td>SLF eggs present</td>
<td>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</td>
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Host Specificity Testing of *A. orientalis*

*Poblicia fulignosa*

*Flatormenis proxima*
Dryinus sp. nr. browni (Hym. Dryinidae)

- Attacks 2nd and 3rd instar nymphs
- Late stage parasitoid larvae exit the host into a protective sac (thylacium) under the wing pad of the nymph
- Mature larvae spin a cocoon; overwinter and emerge the following summer
- 40% parasitism reported in Chinese literature
- June 2018 collection in China; material at ARS quarantine lab in Newark for study
Future Biocontrol Research

• Continue *Anastatus* host-specificity studies
• Determine conditions necessary to induce and break *Anastatus* diapause
• Nymphal parasitoid (*Dryinus* sp.) host specificity testing and life-cycle studies
• Further exploration in Asia for additional natural enemies