Biological Control of *Lycorma*

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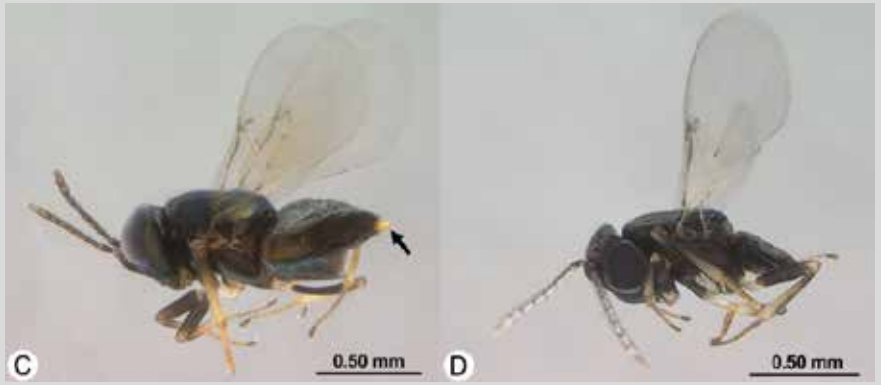
Surveys in the PA infestation zone

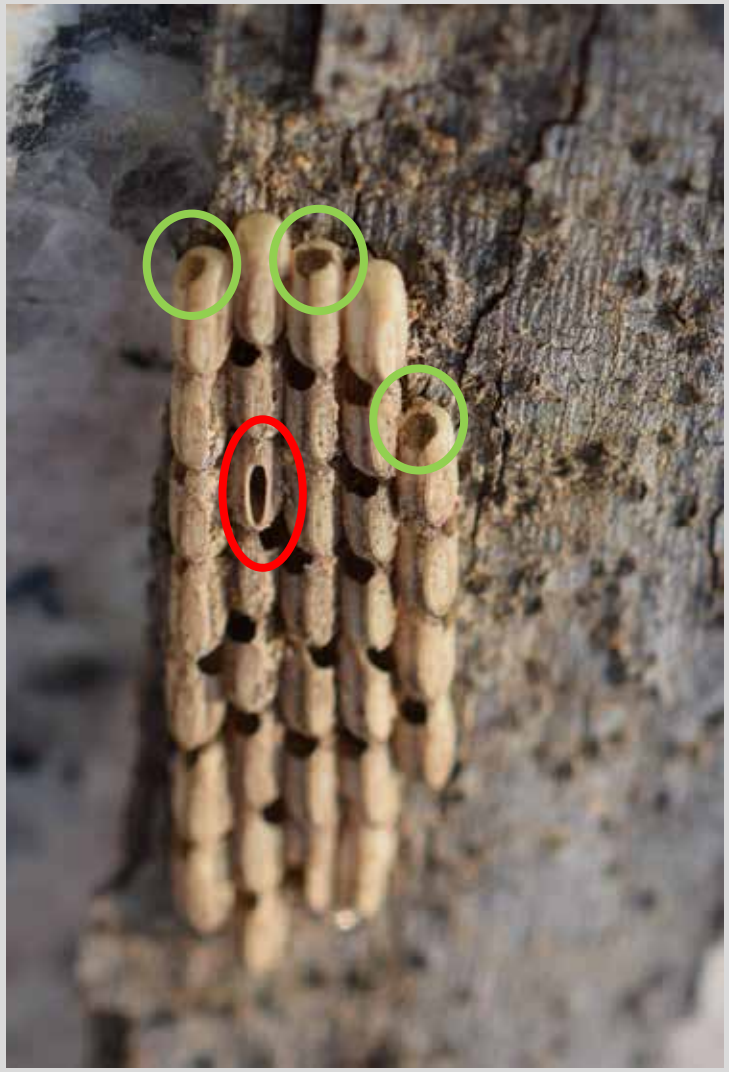
- Egg parasitoid wasp discovered in surveys of PA quarantine zone by HP Liu
- Reported to parasitize ca. 7 % egg masses and 20% eggs within discovered masses. Found only at certain sites.
  - (Liu& Mottern 2017. J. Insect Science)
- Native to Asia (introduced against gypsy moth)
- Not reported from Lycorma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

Ooencyrtus kuvanae
(Hym: Encyrtidae)

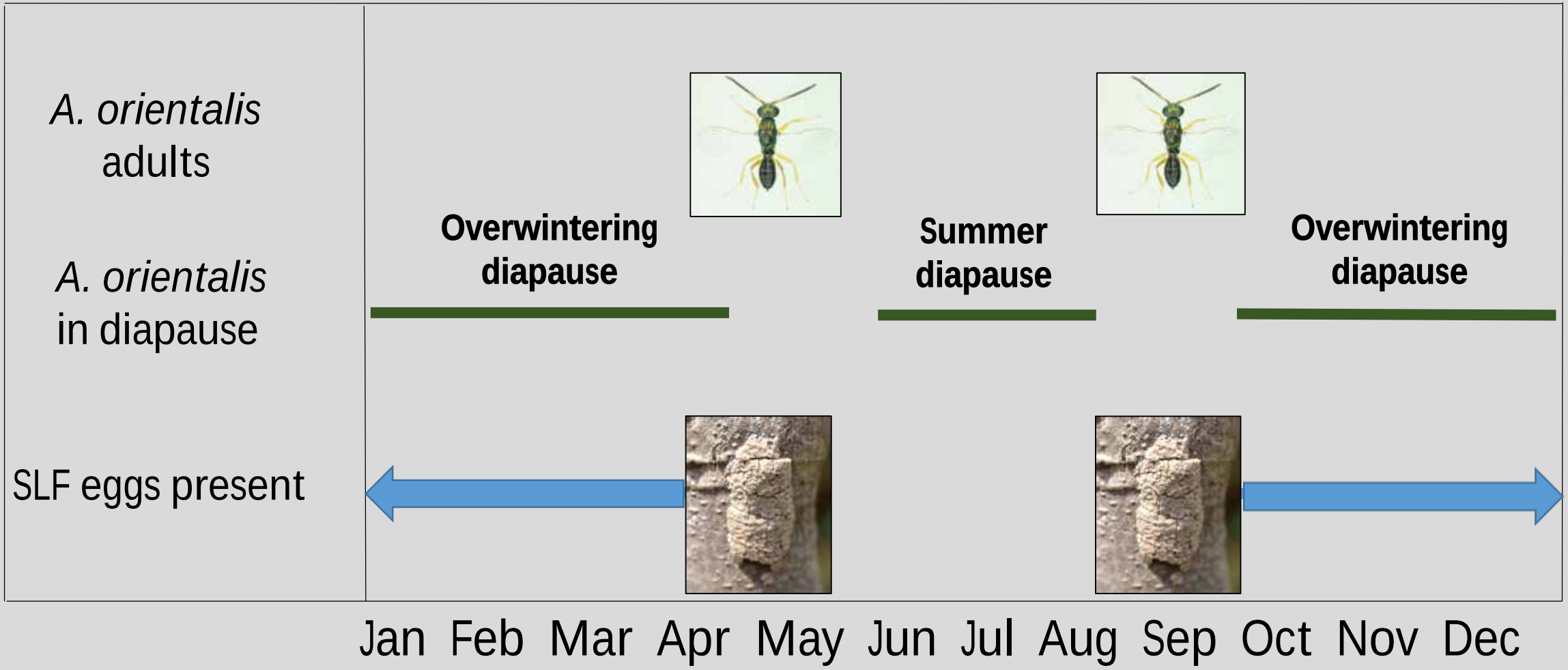


Anastatus orientalis
(Hym.: Eupelmidae)

- 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



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