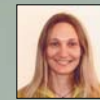




# Realized lifetime parasitism of glassy-winged sharpshooter egg masses by *Gonatocerus ashmeadi* (Hymenoptera: Mymaridae)

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## ABSTRACT

Oosorption and egg maturation results suggested that *G. ashmeadi* is a pro-synovigenic species and females mature more eggs during their lifetime. In the absence of hosts, oosorption was initiated on day 7, where the number of reabsorbed eggs increased at a rate of 1-4 eggs per day. In the presence of hosts female *G. ashmeadi* matured 3-27 eggs per day.



Plate A) GWSS adults feeding on lemon; B) Adult *Gonatocerus ashmeadi*.

## INTRODUCTION & OBJECTIVES

The glassy-winged sharpshooter (*Homalodisca coagulata*) (GWSS) (Plate A), is native to the southeast USA, and is a major economic threat to many Californian agricultural and ornamental industries due to its ability to spread the plant pathogenic bacterium, *Xylella fastidiosa*. Different strains of this bacteria have been reported to cause disease in a wide range of host plants including grapes, almonds, oleander (Plates C-E), stone fruits and many ornamental trees. Using natural enemies is potentially one way of controlling GWSS populations and reducing the spread of *Xylella*-related diseases without the use of chemicals. The self-introduced *G. ashmeadi* (Plate B) is the key natural enemy of glassy-winged sharpshooter egg masses (Plate F) in CA at present. Over summer, parasitism levels of GWSS egg masses by *G. ashmeadi* approaches 100% but parasitism levels of the spring generation of GWSS are substantially lower.



Plate C) oleander leaf scorch, healthy oleander on right; D) Pierce's disease of grapes; E) Almond leaf scorch; F) GWSS egg mass laid on underside of leaves.

Laboratory work has been conducted in an attempt to understand basic aspects of *G. ashmeadi* reproductive biology, parasitism success and host selection behaviors. The next step is to determine: "How big an impact do individual female *G. ashmeadi* parasitoids have on GWSS population growth via parasitization of eggs?" Before field assessments can be conducted, laboratory studies are required to:

- 1) Ascertain the relationship between adult female *G. ashmeadi* size and 24-hr egg load;
- 2) Develop methods to estimate parasitoid age;
- 3) Ascertain the extent to which oosorption occurs;
- 4) Determine whether female parasitoids can mature eggs in excess of those they are born with.

We have demonstrated that there is a positive correlation between <24-hr egg load of female *G. ashmeadi* and mean hind tibia length. Results presented here are shown for objectives 3) and 4). Answers to the four objectives will allow us to develop a composite index that describes the correlative relationship of these four factors. This will predict parasitoid age and egg load in the field and assess the contribution of individual female parasitoids to GWSS suppression under field conditions.

## METHODOLOGY

### Oosorption

- Newly emerged mated female *G. ashmeadi* were individually placed in double ventilated vial cages without hosts and supplied 50% honey-water.
- At days 0, 1, 3, 5, 7, 9, 11 and 13, 15 females were removed, killed and dissected.
- The number of mature, non-mature and reabsorbed eggs were counted, and the length of the right metathoracic tibia was measured.
- Egg load (potential fecundity) was compared with predicted fecundity (estimated from hind tibia length).

### Egg Maturation

- Newly emerged mated female *G. ashmeadi* were individually provided daily with 35 GWSS eggs and 50% honey-water. Daily fecundity was recorded.
- At days 0, 1, 3, 5, 7, 9, 11 and 13 days, 15 females were removed, killed and dissected.
- The number of mature and non-mature eggs were counted, and the hind tibia length measured.
- Realized fecundity (successful parasitism), potential fecundity (realized fecundity + eggs present in ovaries) and predicted fecundity (based on hind tibia length) were calculated for each female.
- Potential fecundity was compared with predicted fecundity to determine whether eggs were being replaced at the rate they are being oviposited

## RESULTS & DISCUSSION

### Oosorption – results in the absence of hosts

*G. ashmeadi* developed 4-8 mature eggs per day up to around 7 days of age before egg load in females began to decline at a rate of 1-8 eggs per day because of oosorption (Fig. 1). In the absence of hosts, females appear to reabsorb mature eggs theoretically enabling them to redirect energy into host seeking and survival, a characteristic of syn-ovigenic species. Figure one demonstrates that female *G. ashmeadi* oosorption was initiated on day 7, and the number of reabsorbed eggs increased at a rate of 1-4 eggs per day, to 12 eggs on day 13.

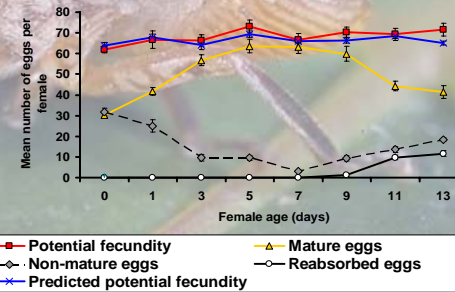


Figure 1. The effect of age on the mean number of mature eggs, immature eggs, reabsorbed eggs, potential fecundity (total eggs counted in ovaries) and predicted fecundity (estimated from hind tibia length) of female *G. ashmeadi* presented with no hosts for 13 days.

### Egg Maturation – results in the presence of hosts

On day 13, potential fecundity (realized fecundity + eggs present in ovaries) was 77 eggs higher than the predicted <24 hr potential fecundity as estimated from hind tibia length (Fig. 2). This suggests that *G. ashmeadi* mature more eggs as they parasitize hosts during their lifetime and indicates that this species is partially syn-ovigenic. Potential fecundity data demonstrates that in the presence of hosts female *G. ashmeadi* matured 3-27 new eggs per day. The potential fecundity of females given hosts for one day after emergence was 26 eggs lower than the predicted <24 hr potential fecundity (Fig. 2). This may indicate that 26 eggs were lost due to superparasitism or early larval death.

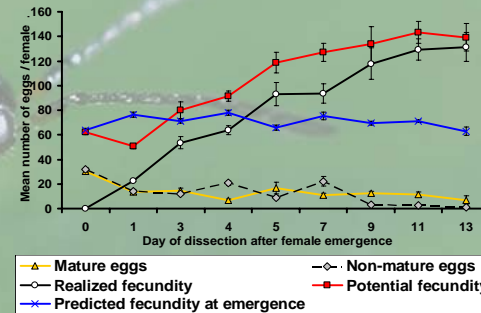


Figure 2. The number of mature and non-mature eggs present in ovaries, realized fecundity (successful parasitism), potential fecundity (realized fecundity + eggs present in ovaries) and predicted fecundity (estimated from hind tibia length) of female *G. ashmeadi* offered hosts daily for 0-13 days after female emergence.

## FUTURE WORK

In 2006 we collected ~ 20 dead female *G. ashmeadi* from the field using funnel traps loaded with dry ice. Females will be aged and egg load at time of emergence will be estimated from hind tibia length. The egg load at time of death (when oosorption and egg maturation are figured into the model) will allow us to estimate the average number of GWSS eggs females parasitize before dying. These estimates of realized field fecundity will allow us to form a much better understanding of what levels of control individual *G. ashmeadi* in the field are achieving.

## ACKNOWLEDGEMENTS

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