

Surveying for Indigenous and Exotic Natural Enemies of BMSB in Diverse Habitats in Maryland



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**BMSB Areawide
Stakeholder Meeting**

Biological Control of BMSB

- No need for an overview of BMSB as a pest
- Sustainable pest management is needed: biological control
- Understand biocontrol better:
 - Who are the players?
 - Where are they in diverse landscapes?
 - Where are they in a geographical region?



Anastatus redivii



Trissolcus spp.

M. Buffington



Ooencyrtus spp.

BT Cutting

From BMSB 4th Working Group June 2015

Goal: Enhance the success of natural enemies as much as possible.

Who are the “players?”

Natural enemies: Parasitoids

Known native species vs

Exotic species



Trissolcus japonicus

Other species?

Where are the natural enemies?

Within diverse landscapes:

- **Better design**
- **Conserve specific habitat features**



City of Detroit Lakes



gettyimages
Sebold/istock

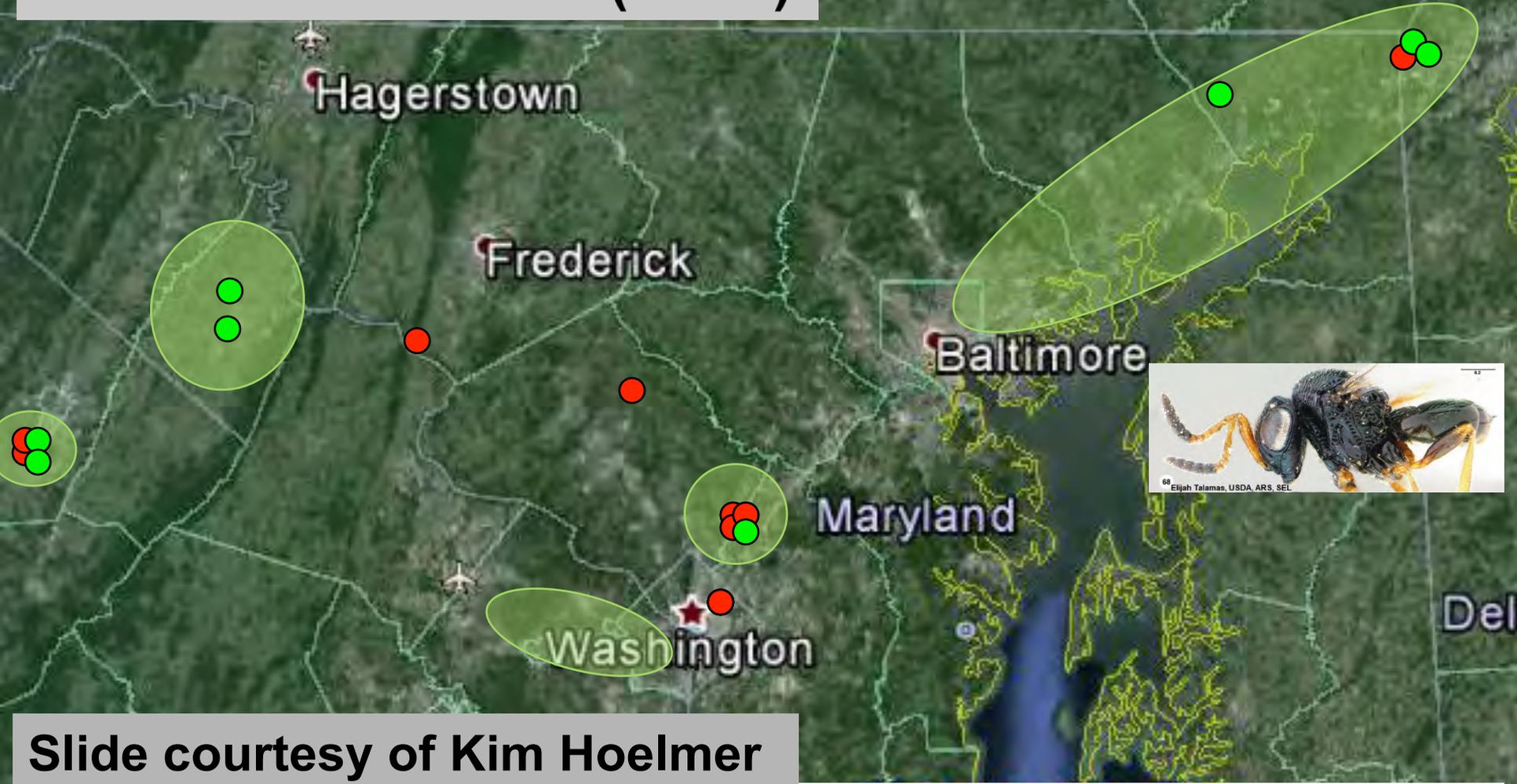
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Lancaster

Appalachian Mountains

Where are the natural enemies?

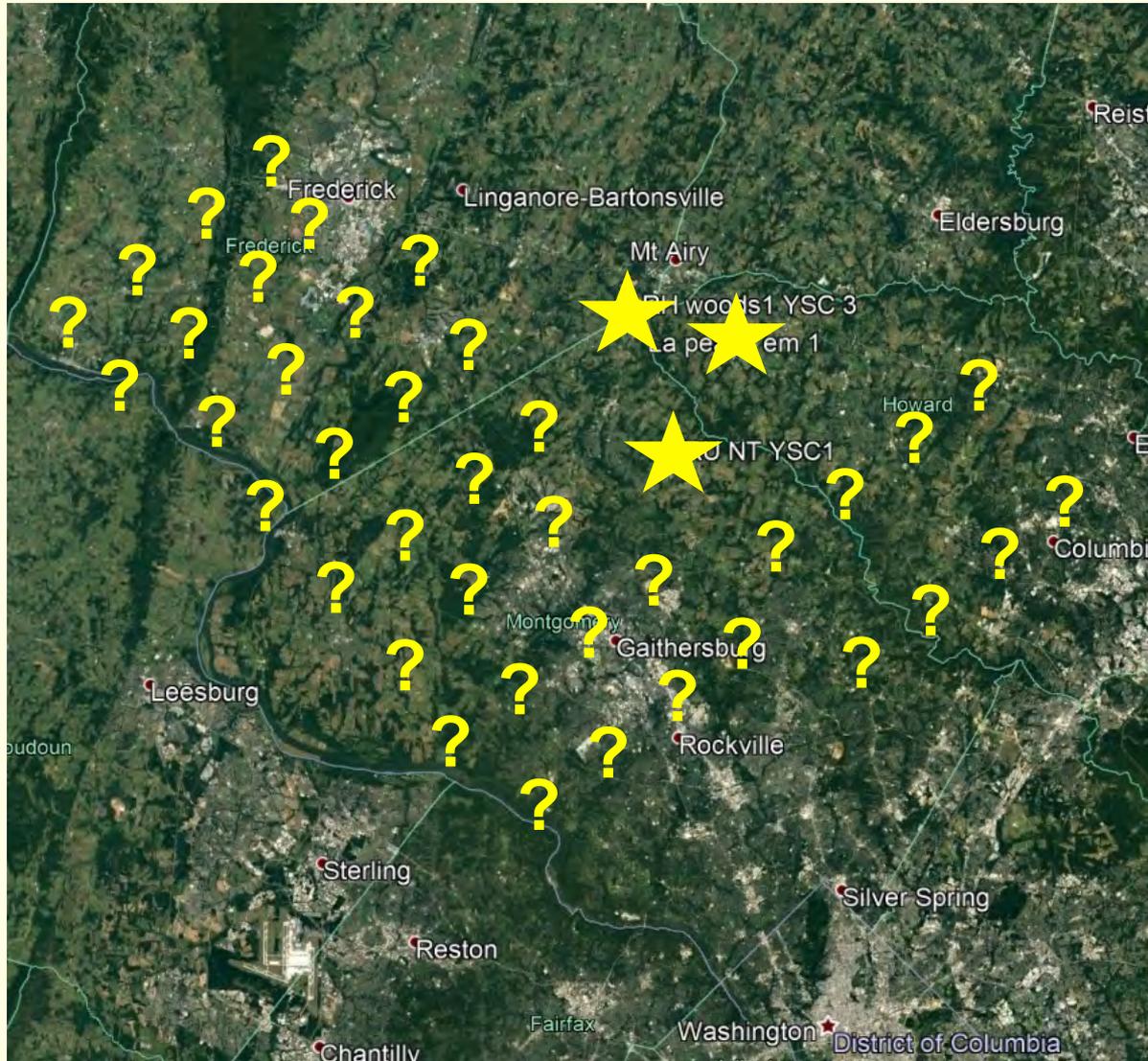
2016 FIELD SURVEY (EAST)



Slide courtesy of Kim Hoelmer

T. japonicus now in: MD, D.C., VA, WV, DE (east coast) & OR, WA (west coast)
2016 Recoveries were all from BMSB (sentinel & wild)

Big Picture vs Reality



Project Stink-be-Gone



- **Citizen science based project with Maryland's Master Gardeners**
- **Project development**
 - **Recruitment**
 - **Training**
 - **Participant interactions and engagement**
 - **Logistics**
 - **Assessing samples**

Recruitment

- **Selected 3 counties in Maryland with large and active Master Gardener groups**
- **Attended monthly meetings**
 - **10 min presentation**

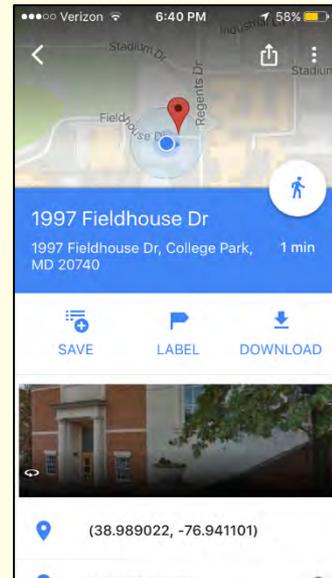


Training

1. Trained 44 people!
2. Overview of
 - stink bug biology
 - biological control
 - host plant lists
2. Hands-on ID of stink bug adults and egg masses
3. 20 minute searching activity outside
4. Sample preparation, data collection, and pack and ship the cooler
5. Pre-quiz and post-quiz
6. Training survey



QUESTIONS				
1-	A	B	C	D
2-	A	B	C	D
3-	A	B	C	D
4-	A	B	C	D
5-	A	B	C	D
6-	A	B	C	D



Participant's Name	Participant's email address	Date
1		
2		
3		
4		
5		
6		

Participant Interactions

- **Website**
- **Emails**
- **Responding to queries on datasheets or notes sent with samples**



Logistics

- Participants searched and collected ≥ 6 hours during two periods (6 weeks) of summer 2017
- Sent samples immediately to UMD via FedEx
- Returned coolers within the day
 - Petri dishes
 - Datasheets
 - New shipping label

The image shows a FedEx shipping label form for a package sent from the University of Maryland, College Park. The form includes the following information:

- Sender Information:** Name: Rebecca Waterworth, Phone: 301.405-3913, Company: UNIVERSITY OF MARYLAND, Address: 4112 PLANT SCIENCES BLDG, City: COLLEGE PARK, State: MD, ZIP: 20742-0001.
- Recipient Information:** Name: Rebecca Waterworth, Phone: 301.405-2635, Company: University of Maryland, Dept of Entomology, Address: 4112 Plant Sciences, 4291 Goldhouse, College Park, MD 20742.
- Tracking Number:** 8099 4827 2367.
- Service:** Express Package Service.
- Options:** Includes checkboxes for various services like FedEx Free Overnight, FedEx Priority Overnight, and FedEx Standard Overnight.
- Payment:** The form indicates that the sender is responsible for payment, with options for Recipient, Third Party, Credit Card, or Cash/Check.

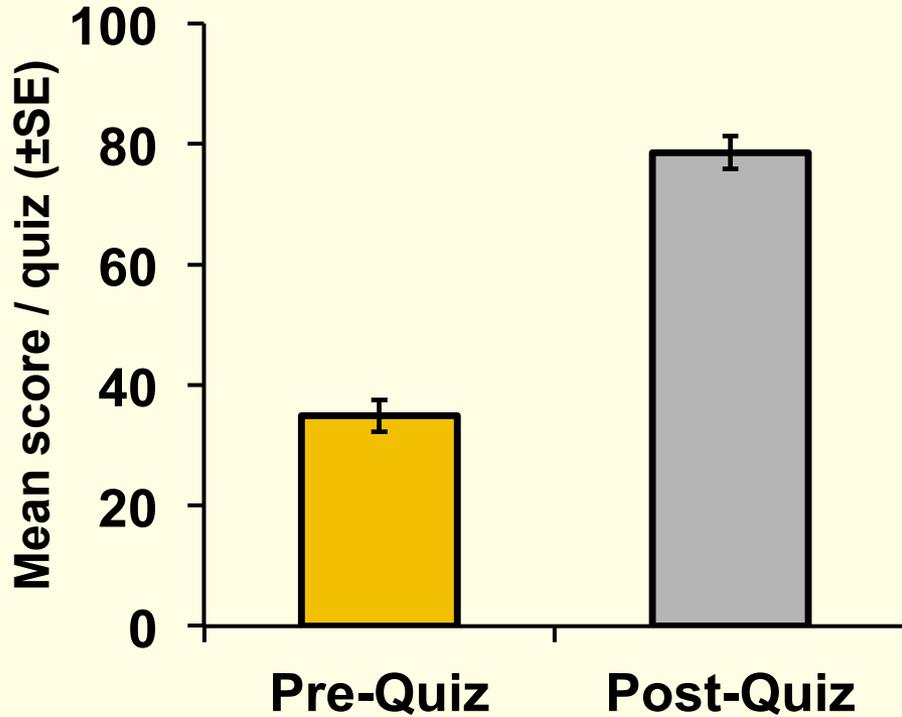


Assessing Samples



- Each sample assigned an ID # – into a growth chamber for parasitoid emergence
- Data collection - ongoing
- For each stink bug egg mass:
 - ID bug genus
 - Quantify eaten or parasitized eggs
 - ID parasitoids to spp
 - Dissect eggs to determine fate
- Summarize host plant, habitat, and locality data

Results: Training



Measure the impact of training in the change in knowledge of participants

Results: Samples



- 301 stink bug egg masses
 - BMSB (9.3%)
 - Harlequin (46.2%)
 - *Euschistus* sp.
 - Green
 - *Podisus* sp.
 - A couple of other spp (TBD)
- 16 other bug egg masses
- 41 moth egg masses
- 25 other “things”

Results: BMSB hosts

Trees/shrubs	Perennials	Annual Flowering Plants	Annual, Vegetables	Vines, Various
<i>Cercis</i> (7)	Red raspberry (3)	<i>Cleome</i> (4)	Tomato (1)	<i>Vitis riparia</i> (1)
<i>Acer</i> (4)	Wine raspberry (1)	<i>Lantana</i> (1)		Virginia creeper (1)
<i>Magnolia</i> (1)				
<i>Tilia</i> (1)				
<i>Paulownia</i> (1)				
Callery pear (1)				
<i>Cornus racemosa</i> (1)				

Results: BMSB hosts

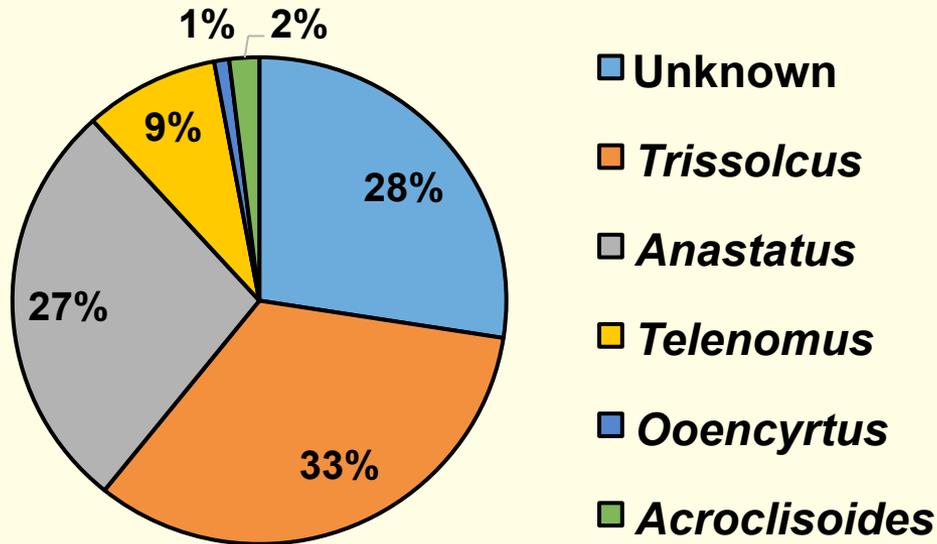
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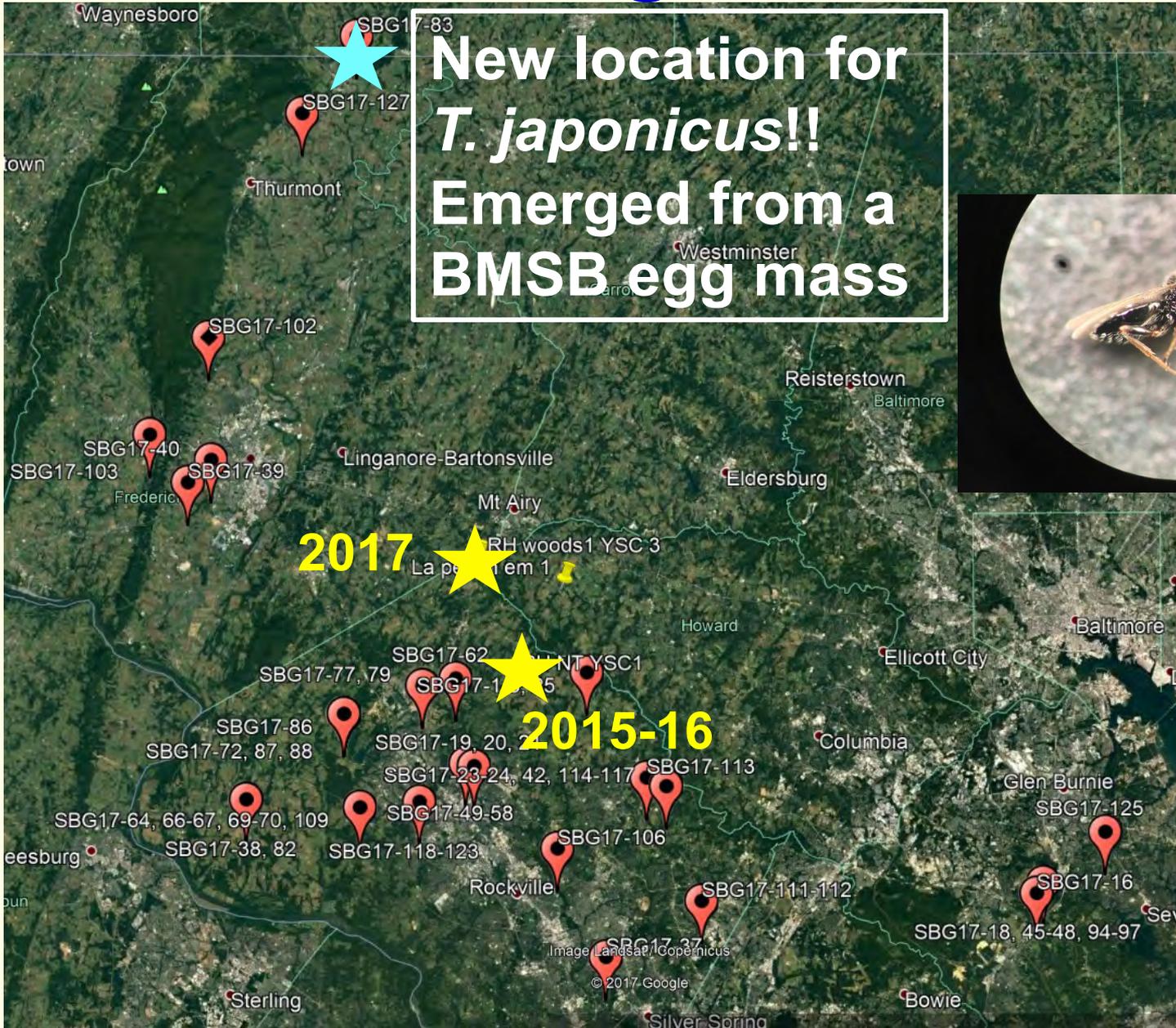
Results: Biological Control

Predation: 5% of all stink bug egg masses with at least one egg eaten

Parasitism: 34% of all stink bug egg masses (102/301)



Results: Biological Control



Results and Discussion

- **Training was effective:**
 - **Increased knowledge about stink bugs**
 - **~79% of samples were stink bug egg masses**
- **Collectively, citizen scientists searched a larger area**
- **Two new plant hosts of BMSB**
- **Signs of biological control**
 - **~40% of stink bug egg masses**
- **New locality for *T. japonicus***

Future Work and Directions

- **Identify:**
 - **Egg masses to bug genus**
 - **Parasitoids to species**
- **Determine egg fate**
 - **Egg dissections**
- **Summarize habitat data**
 - **Where were stink bugs?**
 - **Where were they not?**
 - **In specific habitats, what were the natural enemies?**
- **IRB-approved survey to evaluate entire program**
- **2018 work: Recruit master gardeners farther west in Maryland (higher BMSB pressure)**

Acknowledgements

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- **Michael Ensor**
- **Susan Trice**

Don Weber and Megan Herlihy, USDA ARS IIBBL:

- **Stink bug adults and egg masses**
- **Plant ID**

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Rock Hill Orchard

Ruppert Nursery

Larriland Farm