

# Attack and success of exotic and native parasitoids on Brown Marmorated Stink Bug (*Halyomorpha halys*) and eggs

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# Questions

1. Is the *T. japonicus* detected in MD in 2014 an established population?
2. What are the habitat preferences of *T. japonicus* as well as native parasitoids?
3. If established, to what extent does *T. japonicus* parasitize native beneficial stinkbugs (e.g. *Podisus maculiventris*) ?
4. What is the attack and success rate of parasitism by native parasitoids?

# Methods:

## 3 Habitat types

- Field crop (soybean)
- Orchard (apple) or scattered trees
- Woods (various native and invasive vegetation)



# Methods:

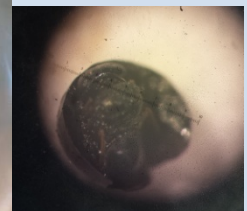
## 3 Egg mass Treatments

- $\leq 24$ -hour-old BMSB eggs
- $\leq 24$ -hour-old BMSB eggs frozen at  $-80^{\circ}\text{C}$  for 2 min.
- $\leq 24$ -hour-old *Podisus maculiventris* eggs



# Methods: Experimental design

- Fresh and frozen sentinel eggs laid on paper towels by colony insects were pinned to various vegetation at each site and were exposed for 72 hrs.
- All egg masses returned to lab and reared out in a growth chamber (16L:8D, 25°C) until either a stinkbug nymph or a parasitoid emerged
- If nothing emerged, eggs were dissected.
- Emerged and dissected parasitoids were sent to Elijah Talamas (USDA ARS SEL) for identification confirmation



# Detection of *Trissolcus japonicus* using sentinel egg masses Beltsville Maryland and vicinity (USDA ARS IIBBL), 2014-15

**HABITAT** *T. japonicus* detect:

Woods	○ absent	present	●
scattered trees	○ absent	present	●
soybean field	○ absent		

filled = also sampled 2014; absent

**Original  
detection  
site 2014**

**BARC core sampling area  
BMSB & *Podisus* egg  
masses**

**BARC satellite sampling areas:  
BMSB eggmasses only, woods only**

Montgomery Co. MD

Prince Georges Co. MD

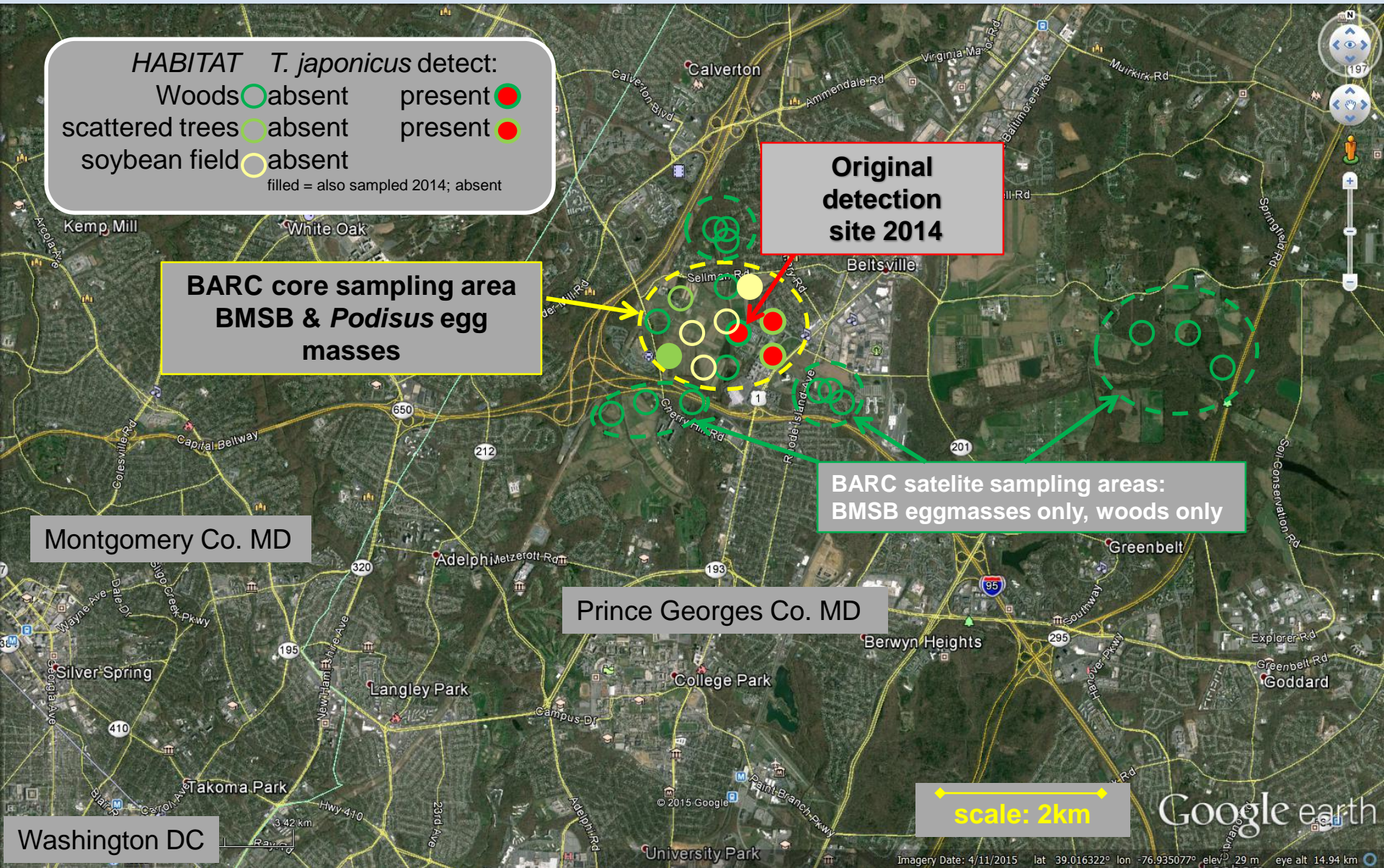
scale: 2km

Google earth

Washington DC

Imagery Date: 4/11/2015 lat 39.016322° lon -76.935077° elev 29 m eye alt 14.94 km

D.Weber 11/8/2015



# Results: Predation



	# of eggs predated	Total number of eggs recovered		% predated
<i>P. maculiventris</i>	2599	13352		19%
Fresh BMSB	4960	14224		35%
Frozen BMSB	3557	14119		25%
total	11116			27%

# Results by egg type

	eggs recovered	% emerged parasitoids	% Trissolcus japonicus LIVE	% Trissolcus native spp. LIVE	% Telenomus podisi LIVE	% Anastatus LIVE	% Other, ALIVE	% dead parasitoids	% Trissolcus japonicus DEAD	% Trissolcus native spp. DEAD	% Telenomus podisi DEAD	% Anastatus DEAD	% Other, DEAD
<b>BMSB Frozen</b>	10616	13.6%	1.7%	8.9%	0.3%	1.5%	1.2%	11.2%	0.0%	1.3%	2.0%	0.3%	7.6%
<b>BMSB Fresh</b>	9792	3.8%	0.3%	0.9%	0.2%	2.1%	0.3%	5.6%	0.0%	0.4%	0.5%	0.0%	4.7%
<b><i>Podisus</i> Fresh</b>	6286	15.3%	1.0%	11.0%	1.8%	0.4%	1.0%	10.6%	0.1%	1.5%	5.5%	0.1%	3.5%



# Results by habitat

	eggs recovered	% emerged parasitoids	% Trissolcus japonicus LIVE	% Trissolcus native spp. LIVE	% Telenomus podisi LIVE	% Anastatus LIVE	% Other, ALIVE	% dead parasitoids	% Trissolcus japonicus DEAD	% Trissolcus native spp. DEAD	% Telenomus podisi DEAD	% Anastatus DEAD	% Other, DEAD
<b>Orchard</b>	<b>8747</b>	<b>8.8%</b>	0.7%	5.5%	0.4%	2.0%	0.2%	<b>6.7%</b>	0.0%	1.2%	0.6%	0.3%	4.5%
<b>Soy</b>	<b>2551</b>	<b>3.1%</b>	0.0%	0.0%	3.1%	0.0%	0.0%	<b>38.8%</b>	0.0%	0.0%	14.7%	0.0%	24.1%
<b>Woods</b>	<b>15396</b>	<b>12.5%</b>	1.4%	8.0%	0.4%	1.4%	1.3%	<b>5.4%</b>	0.1%	1.1%	1.1%	0.0%	3.1%

# Results by parasitoid species

	<b>% parasitized</b>	<b>% parasitoid adults stuck inside eggs</b>
<b><i>A. redivii</i></b>	11%	8%
<b><i>T. japonicus</i></b>	7.5%	3%
<b><i>T. euschisti</i></b>	31%	10%
<b><i>T. brochymenae</i></b>	9%	20%
<b><i>T. edessae</i></b>	5%	12%
<b><i>Te. podisi</i></b>	21%	75%
<b><i>Encyrtid sp.</i></b>	7%	5%

# Results: *Trissolcus japonicus*

- **18 egg masses (total of 320 eggs) parasitized by *T. japonicus*: approx. 1% of all egg masses deployed**
- **High rate of successful emergence (95%) in all egg mass types**
- **Habitats: soybean, 0 of 4 sites**
  - scattered trees (or orchard): 5 egg masses (2 of 5 sites)**
  - woods: 13 egg masses, only at the original 2014 site (of 17 total woody sites)**
- **Egg types: Fresh BMSB, 3**
  - Frozen BMSB, 11**
  - Fresh *Podisus*, 4 (detected at all three sites)**

# Preliminary summary for 2015

- **Predation** was significant, consuming >25% of eggs deployed.
- Successful **parasitism** was ~15% in *Podisus* and frozen BMSB eggs, but <4% in fresh sentinel BMSB eggs.
- All parasitoids had distinct habitat preferences.
- Among native parasitoids, *Anastatus* showed the most successful parasitism of fresh BMSB eggs, but native *Trissolcus* and *Telenomus* usually failed to emerge.
- *Trissolcus japonicus* was present in 3 sites, all either open woods or scattered trees, within 600m of 2014 discovery.
- *T. japonicus* was not present in abundance, and only after mid-July. It successfully parasitized all egg mass types, including sentinel *Podisus* eggs.

# Future research

- Continue to define the distribution and field behavior of *T. japonicus*, including habitat and host cues.
- Define conditions under which native parasitism and predation can be significant.
- Use sleeve cages to better simulate naturally-laid egg masses.



# Acknowledgements

- Emma Thrift, Abby Rosenberg, and Nate Erwin for their field work and other help!



Don is sorry he cannot attend the workshop.... and wishes he got the license plate he originally requested!

