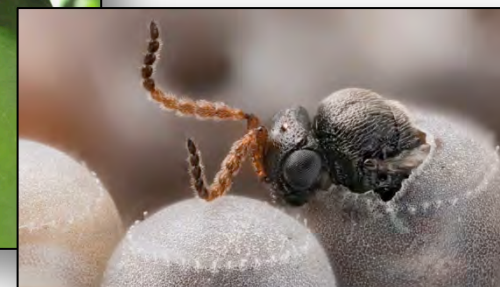


Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.



Photograph: Elijah J. Talamas, ARS USDA.



Photograph: **Christopher Hedstrom**
USDA-APHIS Quarantine Facility,
Corvallis, Oregon



Art Agnello
CALs - NYSAES

Tessa Grasswitz
CCE-LOFT

Debbie Breth
CCE-LOFT (Retired)

BMSB Integrated Pest Management (IPM) & Areawide Meeting
Wednesday, November 29, 2017

Alson H. Smith Research and Extension Center, Winchester, VA

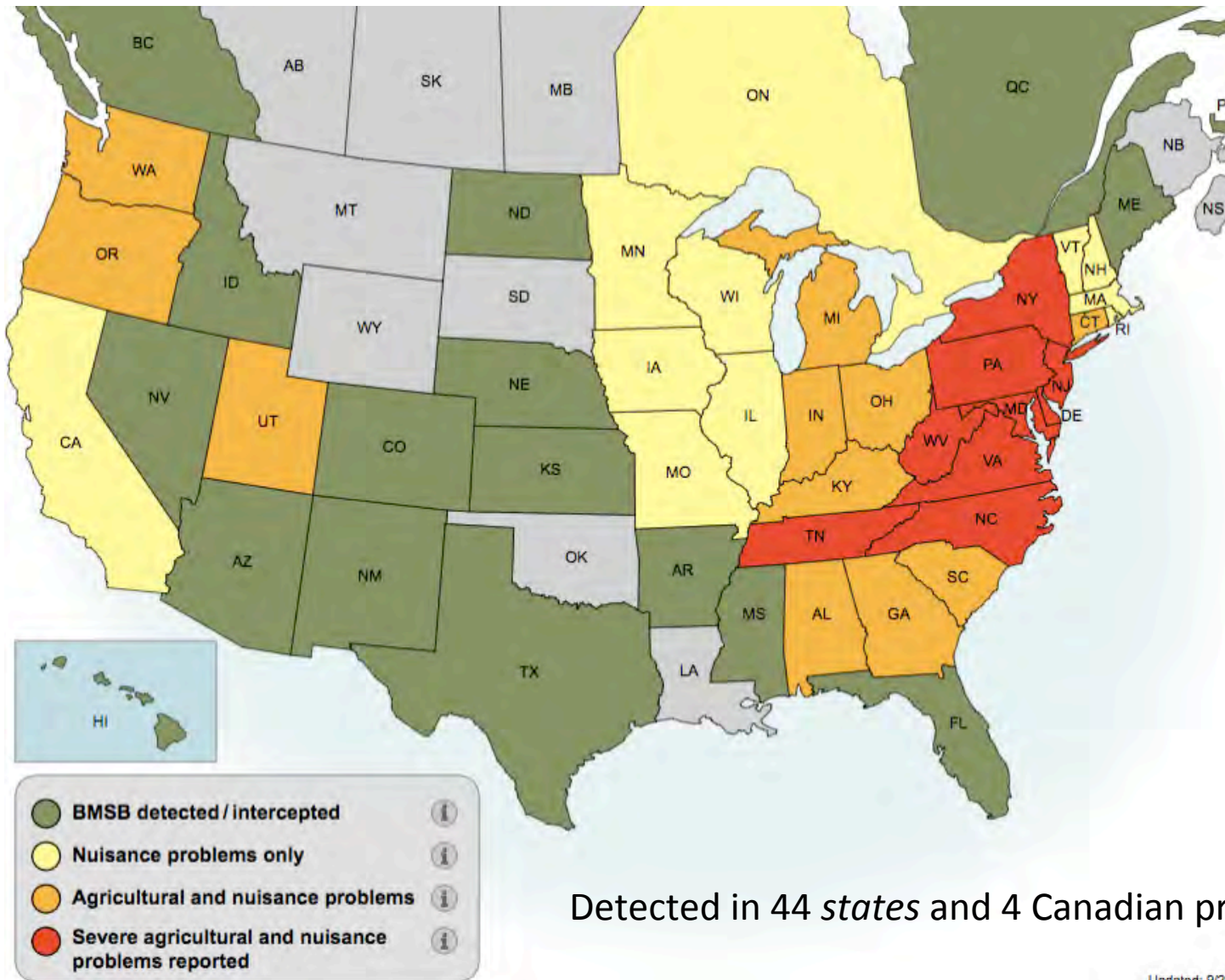


Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.



- Introduction
- 2016 Parasitoid sentinel egg survey's
 - Find of Adventive Samurai Wasp, *Trissolcus japonicus* in NYS.
- 2017 Biological Control of BMSB
 - Parasitoid sentinel egg survey
 - *T. japonicus* release sites
 - *T. japonicus* re-capture

The Brown Marmorated Stink Bug in the Ag. & Urban Environment



brown marmorated stink bug

Halyomorpha halys (Stal)

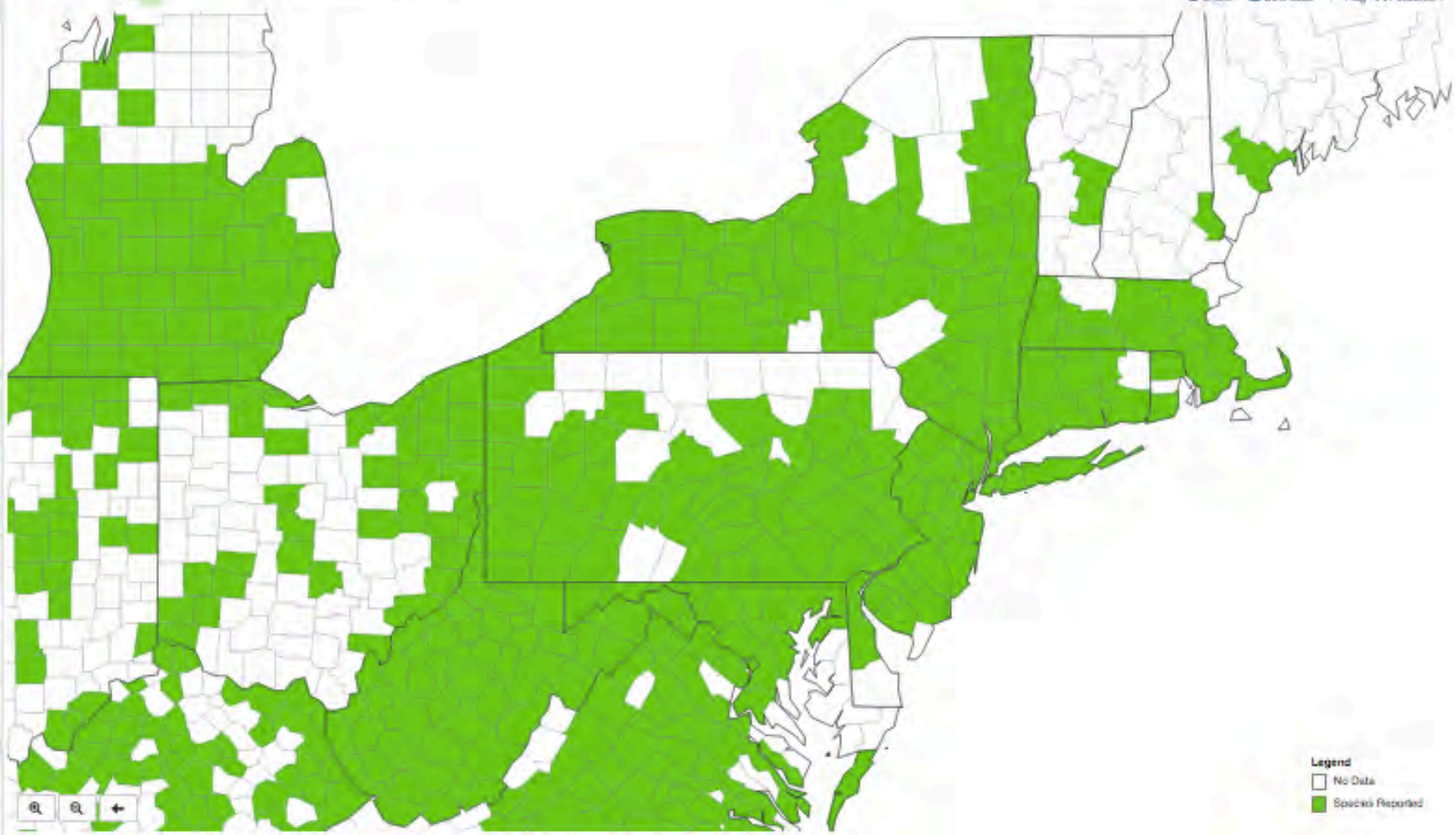
Species Information

States **Counties** Points List

Detected in all but 6 of 62 counties in NYS

Distribution Record Density Literature vs Observation

CSV KML GPX Shapefile
Share Download Print Fullscreen



Brown Marmorated Stink Bug: Monitoring & Threshold



Hudson Valley
Research Laboratory
Supporting the
NYS Agricultural Community

Welcome:
Peter Jentsch, Cornell University
Logout

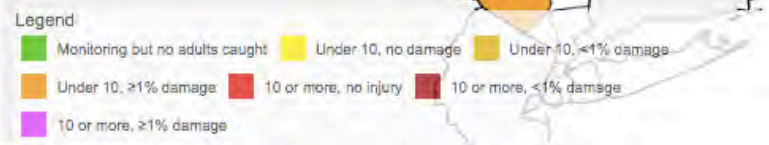
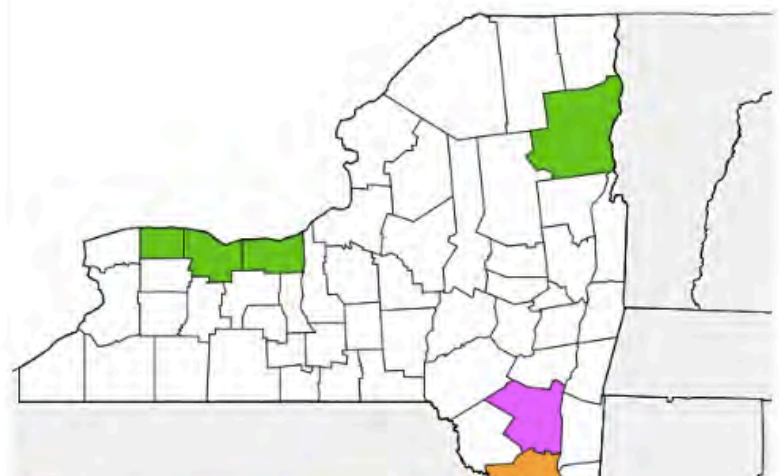
[EDDMapS Home](#)

Welcome to BMSBNY

2017 Monitoring BMSB Detections since 2010 US Counties

[Share](#) [Flag](#) [Fullscreen](#)

Brown Marmorated Stinkbug Monitoring - 10-7-2017 to 10-17-2017



Project Management

- Site Management
- User Management
- Assign Users to Sites
- View Master Site Users Assignment List

Project Forms

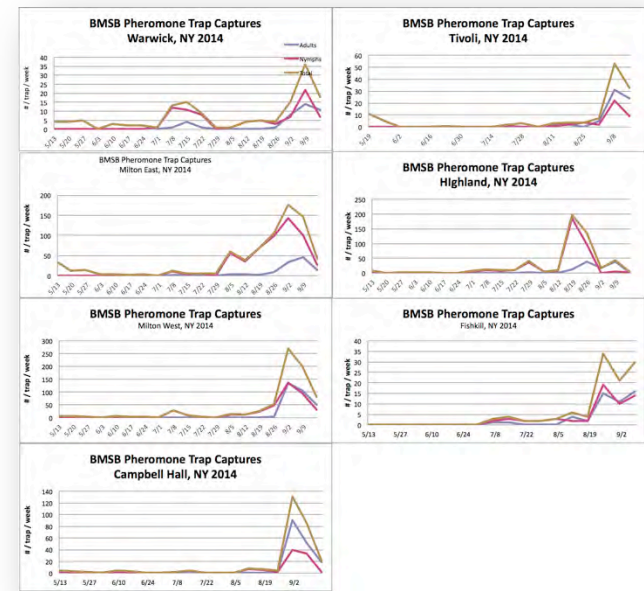
Single Site Data Entry

Recent Data Entry

Date Checked	Reporter
10/12/2017	Peter Jentsch Cornell University
10/09/2017	Peter Jentsch Cornell University
09/26/2017	Peter Jentsch Cornell University
09/26/2017	Peter Jentsch Cornell University
09/21/2017	Peter Jentsch Cornell University
09/11/2017	Peter Jentsch Cornell University
09/11/2017	Peter Jentsch Cornell University
09/11/2017	Peter Jentsch Cornell University
09/11/2017	Peter Jentsch Cornell University
09/05/2017	Peter Jentsch Cornell University



10 adults / trap / week



Trissolcus japonicus, (Hymenoptera: Scelionidae)



Trissolcus japonicus

Background:

- Kim Hoelmer, USDA-ARS, Newark DE, Beneficial Insects Introduction Research. In 2007 he surveyed natural enemies of BMSB in Asia, returning with live parasitoid specimens, held in U.S. quarantine facilities.
- *Trissolcus japonicus* found to highly successful with parasitism of *H. halys* eggs reported to be as high as 80% in China (Talamas et al. 2013).

Host Specificity of the parasitoid wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae)



- In choice and non-choice tests of parasitoid wasps species found *Trissolcus japonicus* to be **highly effective**, parasitizing 60-100% of the eggs in BMSB clusters.
- *T. japonicus* is **highly specific** in choice tests, choosing BMSB over other pentitomiid eggs. However, in non-choice tests *T. japonicus* will oviposit into the eggs of the predatory spined soldier bug, *Podisus maculiventris* (Say).



Trissolcus japonicus

Field Recovery Sites in the US



- In 2014 **adventive** populations (wild) of *T. japonicus* were found in Beltsville, MD using sentinel BMSB eggs.
- In 2015 *T. japonicus* were found in Vancouver, Washington, DC and Winchester, VA,.
- In 2016, *T. japonicus* was also found in VA, WV, MD, DE NJ and NY in the East, and OR in the West.

*Sentinel eggs: BMSB egg clusters killed at -80C, placed on host plants. HVRL employ sentinel eggs along the edge of agricultural site



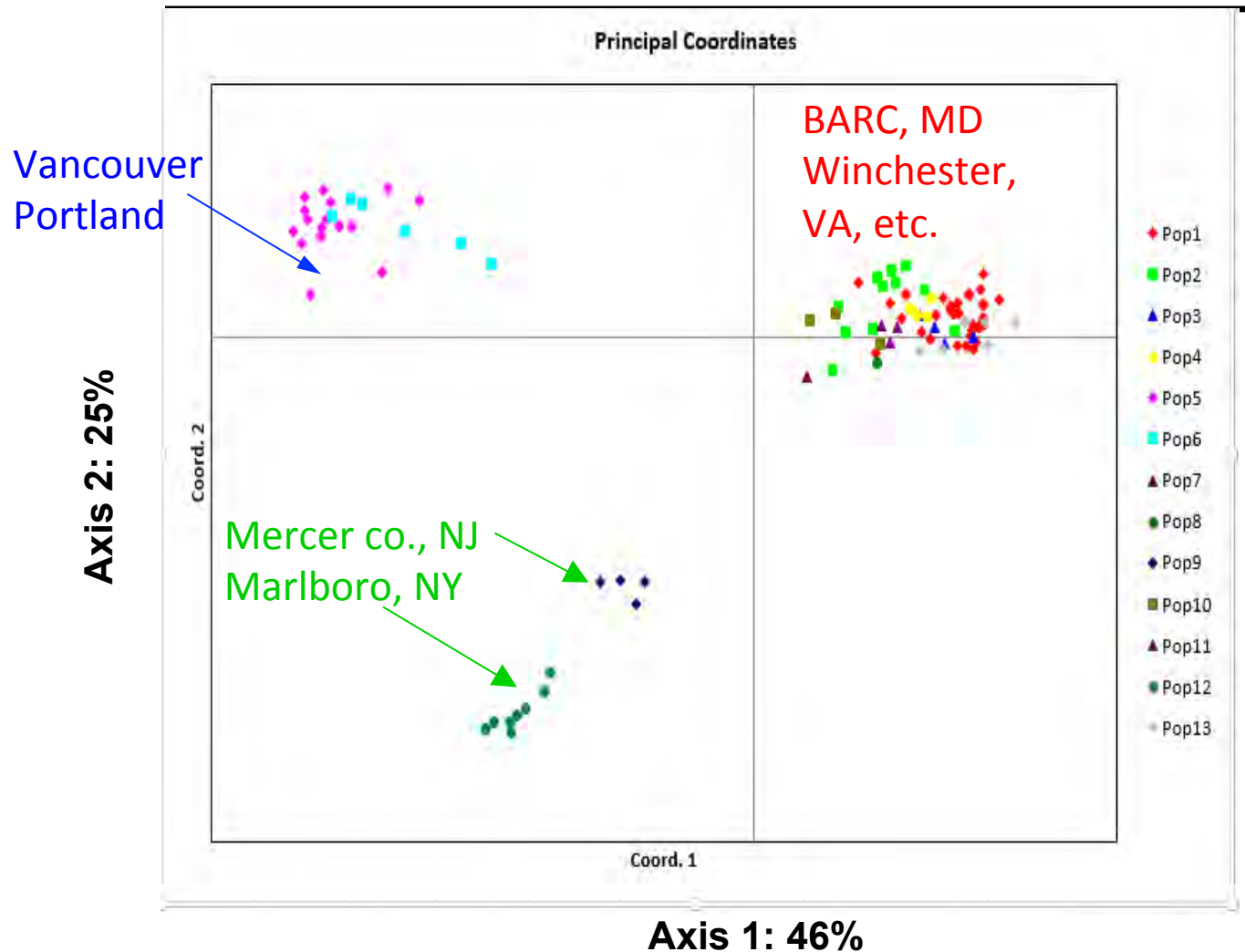
Trissolcus japonicus

Field Recovery Sites in the US

- Marie-Claude Bon in USDA-ARS European Biological Control Laboratory (Montpellier, France) extracted and characterized DNA from submitted *T. japonicus* specimens
- Utilized 23 microsatellite gene markers to differentiate genotypes from thirteen different Asian *T. japonicus* populations, including those in quarantine in the U.S. and others collected in Asia in 2012-2013 by Kim Hoelmer's team at the USDA-ARS.
- Adventive *T. japonicus* populations have been assayed for genotype.
- It was **determined that none of the adventive finds originated from the populations held in quarantine (unpubl.), and thus represented independent introductions of *T. japonicus*.**

(E. Beers. PROC. ENTOMOL. SOC. WASH. 118(3), 2016, pp. 466–470)

Principale Coordinate Analysis (PCoA)- 115 spécimens recovered in US génotype



Axis 1: Split between Western and 2 Eastern populations and all the others

Axis 2: Split between Western and the 2 Eastern populations

2016-17 BMSB Sentinel Egg Mass Survey in NY State

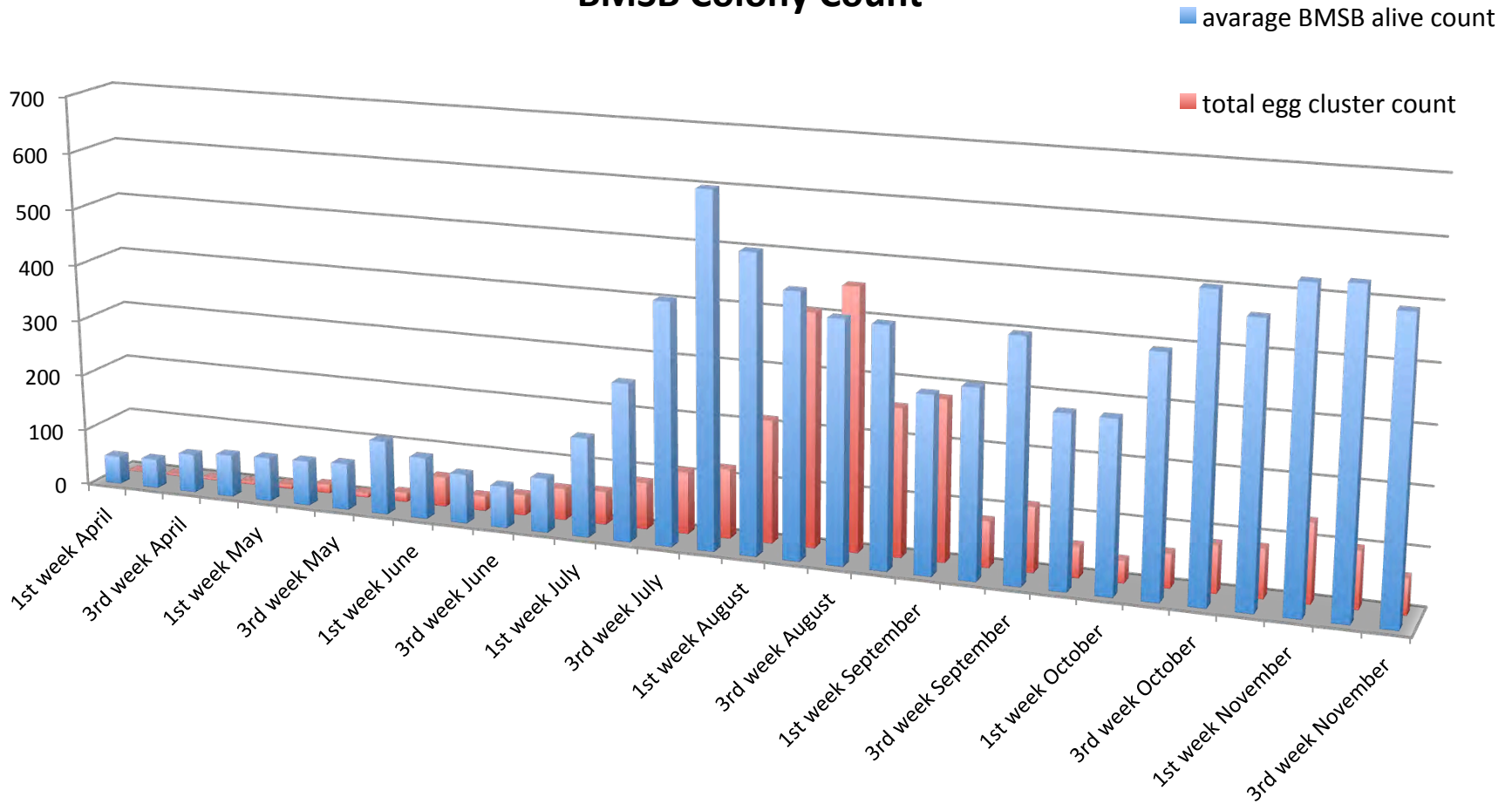
Developing BMSB Colonies for Sentinel Survey's

- Rear BMSB in tents containing Jalapeno Pepper plants & *A. altissima* foliage (75°F, 14/10 L/D 72%rH)
- Utilize eggs deposited onto foliage
- Freezing BMSB eggs to -80C
- Stored eggs at 34°F



Brown Marmorated Stink Bug Colony in 2016

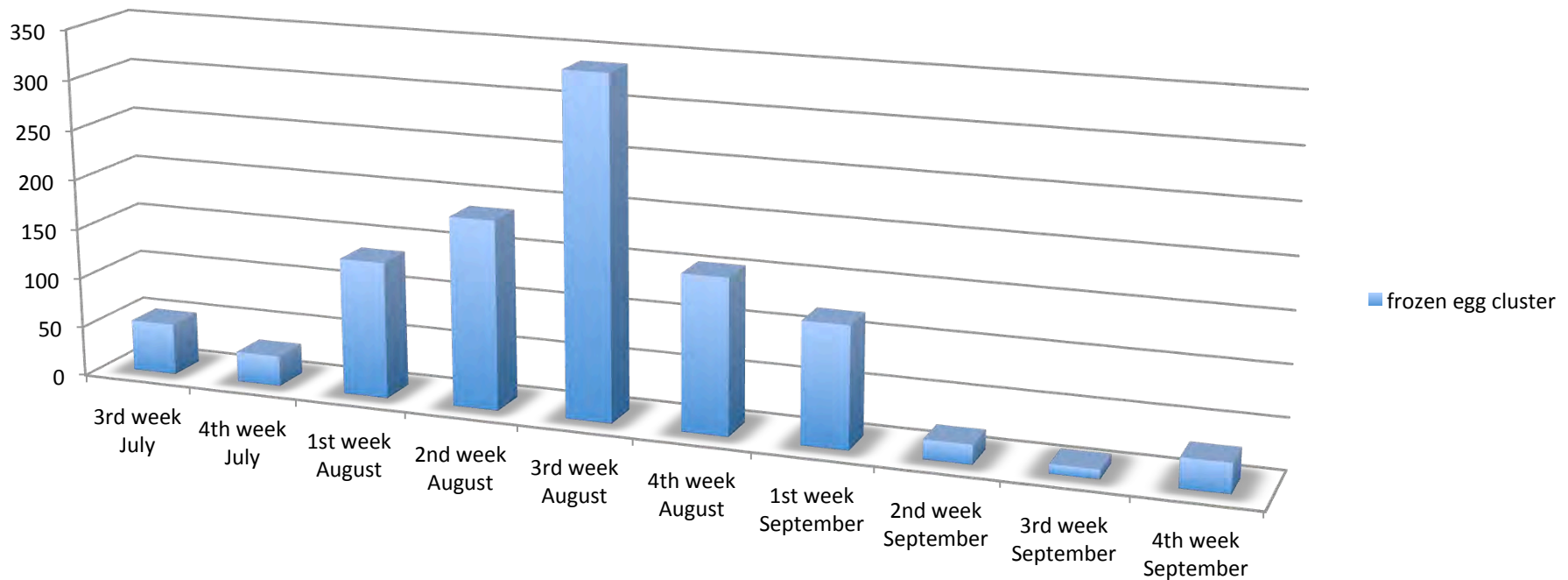
BMSB Colony Count



By 15th July >2000 BMSB throughout the remainder of the season

Brown Marmorated Stink Bug Colony in 2016

Frozen Egg Cluster Count



975 egg clusters
27,300 eggs in total

BMSB Sentinel Egg Mass Survey in NY State



BMSB healthy egg cluster



Parasitism of egg



Predatory feeding tubes



Predatory chewing

- Eggs were placed into the field for 5 days
- Placed into petri dishes
- Assessed for parasite emergence
- Specimens were keyed out to *Trissolcus* sp.
- And submitted to Elijah Talamas for species confirmation.

2016 BMSB Sentinel Egg Mass Survey in NY State



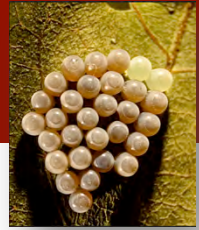
New York State

Marlboro, NY

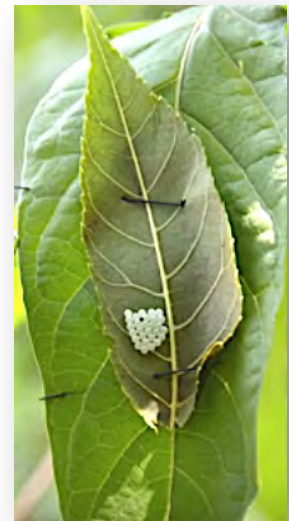
Warwick, NY



2016 *H. halys* Sentinel Egg Deployment



- 2016 Deployment
 - 4 locations / farm on 2 Hudson Valley NY Sites
 - Marlboro (organic vegetable), Warwick (tree fruit orchard)
 - July 22nd – 16th September
 - 24 clusters / week (N=672 cl; 6048 eggs)
 - Single site parasitism of 2 clusters on 12th- 17th Aug.
 - Emergence of 17 / 4 wasps on 8th and 9th Sept.



NYS DEC Liberation of Wildlife Permit

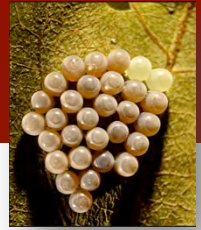
After in-depth review of applicable provisions of the Environmental Conservation Law (ECL) and Codes, Rules and Regulations of the State of New York (NYCRR), **DEC has concluded that its regulatory authority extends to the issuance of permits for the release of specifically defined species of wildlife and listed endangered, threatened, and/or invasive species.** Wildlife is defined in ECL S 1 1-0103. Endangered and threatened species are identified in 6 NYCRR Part 182, and listed **invasive species are identified in 6 NYCRR Part 575.**

DEC has recently concluded that their statutory and regulatory framework around the Liberation of Wildlife Permit regulating release of biologicals such as insects does not generally apply to releasing insects into the wild, so long as the proposed release is not of an insect that is listed on either the endangered or invasive species listings.

Upon review by the DEC, the adventive *T. japonicus* population does not require a license or permit from DEC to undertake the movement and release of the Samurai wasp, as it is not listed within 6 NYCRR 575.



2017 *H. halys* Sentinel Egg Deployment

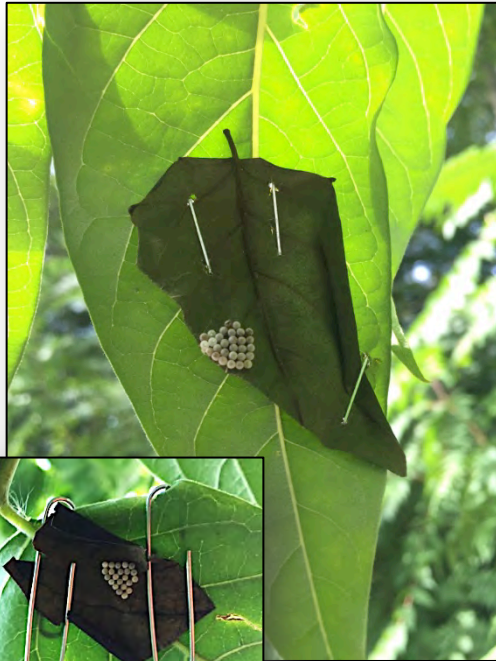


7 WNY sentinel sites and 4 ENY sites were selected to survey for parasitoids.

- Sentinel eggs lain on leaves were attached to known BMSB host foliage. 3 clusters/site/wk.

June 23th - Oct 1st Sentinel eggs to cooperators in overnight

- Placement in Wayne, Orleans, Ontario, Columbia, Ulster, counties
- Recollection of eggs sent and reared at the HVRL, placed in petri dishes and held in a controlled environment chamber at 25 ° C. after 5-7d,
- Eggs were monitored for hatch of stink bugs or emergence of parasitoids, identified by E. Talamas.
- Adults parasitoids reared from sentinel egg masses given a 90% honey-water solution droplets on dish



Baseline Sentinel *H. halys* Egg Survey Placement Sites in NYS (N=10 Farms, 3-24 clusters/site/wk. N=2700 sentinel eggs, 6 plant hosts)

Farm	Town	County	Plant Host Plant	Latitude	Longitude
Schutt Orchard	Webster	Monroe	<i>Acer saccharum</i> (<i>sugar maple</i>)	43°11'3.78"N	77° 26' 56.76"W
Windmill Orchard	Ontario	Ontario	<i>Acer saccharum</i> (<i>sugar maple</i>)	43°15'50.27"N	77° 22' 35.32"W
KM Davies	Williamson	Wayne	<i>Acer saccharum</i> (<i>sugar maple</i>)	43°14'10.54"N	77 °11' 23.63"W
Wooded	Holley	Orleans	<i>Juglans nigra</i> (<i>Walnut</i>)	43° 13' 59.52"N	78° 18' 7.27"W
Wooded	Lyndonville	Orleans	<i>Malus sp.</i> (<i>crab apple</i>)	43° 19' 38.28"N	-78° 19' 33.96"W
Wooded	Medina	Orleans	<i>Ailanthus altissima</i> Tree of Heaven	43°12'1.79"N	78° 23' 36.81"W
Hepworth Farms	Marlboro	Ulster	<i>Robinia pseudoacacia</i> (<i>Black Locust</i>)	41°40'14.72"N	74° 5' 11.21"W
Hepworth Farms	Marlboro	Ulster	<i>Ailanthus altissima</i> Tree of Heaven	41°40'14.72"N	74° 5' 11.21"W
Crist Orchard	Walden	Orange	<i>Ailanthus altissima</i> Tree of Heaven	41°33'2.64"N	74° 9' 50.72"W
Minard Orchard	New Paltz	Ulster	<i>Vitis sp.</i> (<i>wild grape</i>)	41°42'1.47"N	74° 4' 24.13"W

Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

2017 Sentinel Egg Emergence

Native

Trissolcus euschisti (6/23)
(N=1 Marlboro, Ulster Co.)

Telenomus podisi (6/30)
(N=3 Marlboro, Ulster Co.)

Asian Invasive

Trissolcus japonicus (7/7)
Only in Marlboro, Ulster Co.
(N=96)



Photograph: **Christopher Hedstrom**
USDA-APHIS Quarantine Facility,
Corvallis, Oregon

Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

Parasitized Egg Parasitoid Release
'Redistribution'

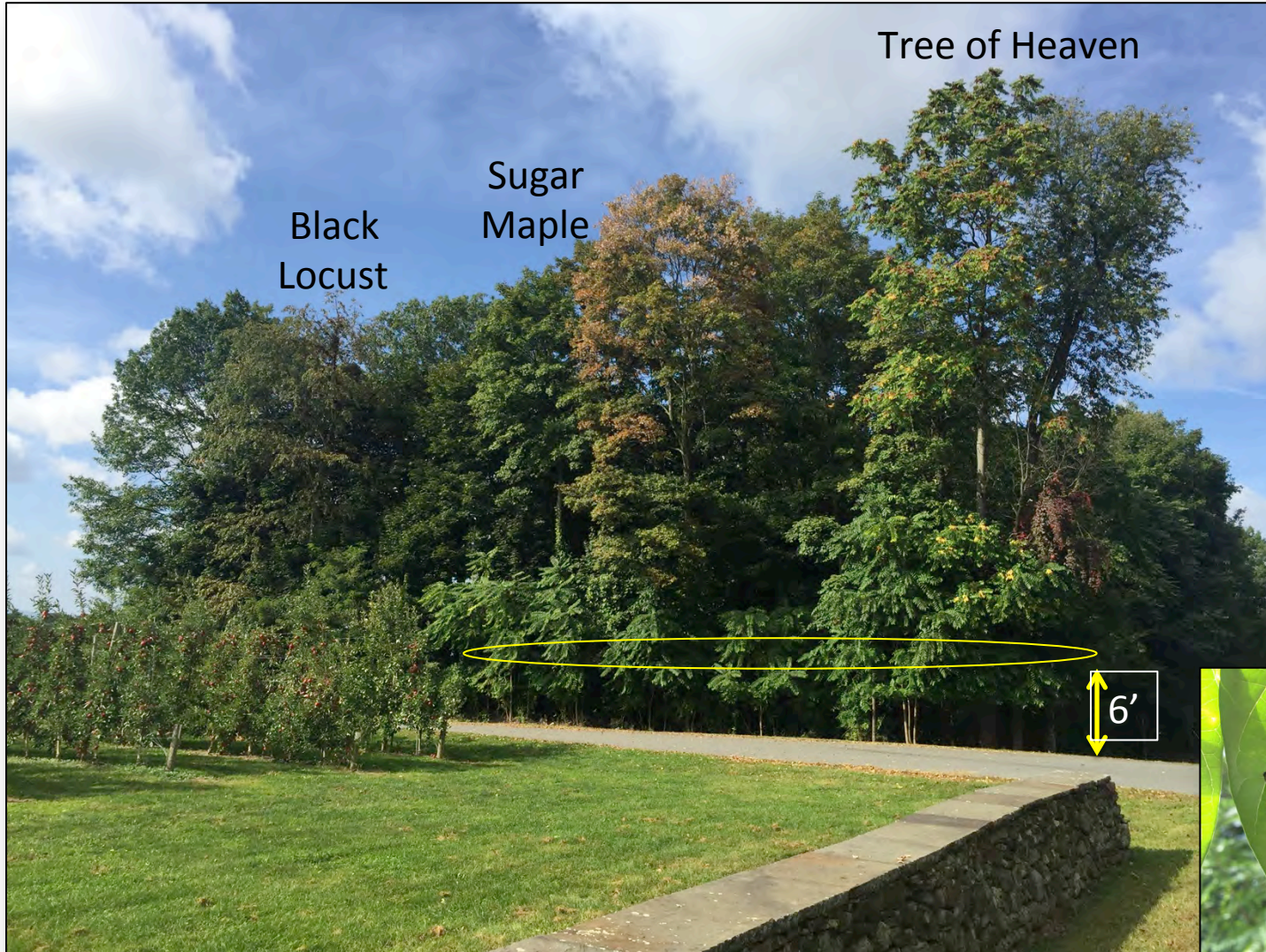


T. Japonicus Egg Placement

- Captured adventive *T. japonicus* from Hepworth Farms in Marlboro, NY on July 7th 2017.
- Wasps reared and used to parasitize frozen BMSB eggs.
- 1st parasitized eggs sent to cooperators beginning on 15th September.
- Parasitized eggs placed onto 32 sites, on 25 farms in 5 NY counties.



Brown Marmorated Stink Bug: Biological Control Release Sites



Placement Sites of *T. Japonicus* parasitized eggs in NYS (N=24 Farms, 32 sites, 87 clusters; ≈ 2300 eggs onto 7 host plant *sp.*)

Site	Town	County	Date	Clusters	Eggs	Placement / Host Plant	Latitude	Longitude
1	Webster	Monroe	15-Sep	3	78	<i>Acer saccharum</i> (<i>sugar maple</i>)	43°11'3.78"N	77°26'56.76"W
2	Holley	Orleans	22-Sep	3	84	Black Walnut	43°14'0.42"N	78° 1'10.46"W
3	Modena	Ulster	22-Sep	3	89	<i>Vitis riparia</i> (Native grape)	41°41'25.15"N	74° 4'3.51"W
4	New Paltz	Ulster	22-Sep	3	76	<i>Vitis riparia</i> (Native grape)	41°42'1.57"N	74° 4'24.22"W
5	Clintondale	Ulster	22-Sep	3	72	<i>Acer saccharum</i> (<i>sugar maple</i>)	41°41'32.91"N	74° 3'18.67"W
6	Walden	Orange	22-Sep	2	54	<i>A. altissima</i> (Tree of Heaven)	41°33'1.34"N	74° 9'36.77"W
7	Gardener	Ulster	23-Sep	3	74	<i>Robinia pseudoacacia</i> (Black Locust)	41°40'14.72"N	74° 5'11.21"W
8	Warwick	Orange	23-Sep	2	56	<i>A. altissima</i> (Tree of Heaven)	41°13'55.83"N	74°22'0.66"W
9	Warwick	Orange	23-Sep	2	56	<i>A. altissima</i> (Tree of Heaven)	41°13'52.59"N	74°23'11.62"W
10	Fishkill	Dutchess	24-Sep	3	73	<i>Robinia pseudoacacia</i> (Black Locust)	41°31'12.02"N	73°49'40.04"W
11	Hudson	Columbia	24-Sep	2	56	<i>Vitis riparia</i> (Native grape)	42°11'6.33"N	73°49'47.25"W
12	Hudson	Columbia	24-Sep	2	54	<i>A. altissima</i> (Tree of Heaven)	42°11'16.36"N	73°49'58.86"W
13	Marlboro	Ulster	24-Sep	2	56	<i>Rhus sp.</i> (Sumac)	41°38'13.67"N	74° 0'24.57"W
14	Milton	Ulster	24-Sep	3	78	<i>A. altissima</i> (Tree of Heaven)	41°39'4.29"N	73°59'33.93"W
15	Milton	Ulster	24-Sep	3	74	<i>Robinia pseudoacacia</i> (Black Locust)	41°38'43.94"N	73°59'24.84"W
16	Modena	Ulster	24-Sep	2	59	<i>A. altissima</i> (Tree of Heaven)	41°40'1.19"N	74° 7'44.19"W
17	Red Hook	Dutchess	24-Sep	3	73	<i>A. altissima</i> (Tree of Heaven)	42° 3'14.98"N	73°50'55.49"W
18	Tivoli	Dutchess	24-Sep	3	72	<i>Robinia pseudoacacia</i>	42° 2'56.09"N	73°52'59.69"W
19	Valatia	Columbia	24-Sep	2	59	<i>A. altissima</i> (Tree of Heaven)	42°14'48.18"N	73°43'25.07"W
20	Milton	Ulster	26-Sep	3	87	<i>Acer saccharum</i> (<i>Sugar Maple</i>)	41°38'39.48"N	73°58'6.6"W
21	Poughkeepsie	Dutchess	28-Sep	3	76	<i>Robinia pseudoacacia</i> (Black Locust)	41°40'40.28"N	73°53'50.91"W
22	Clintondale	Ulster	29-Sep	3	82	<i>Acer saccharum</i> (<i>Sugar Maple</i>)	41°40'39.00"N	74° 3'19.43"W
23	Clintondale	Ulster	29-Sep	3	84	<i>Vitis riparia</i> (Native Grape)	41°40'24.16"N	74° 3'30.29"W
24	Highland	Ulster	29-Sep	3	84	<i>A. altissima</i> (Tree of Heaven)	41°41'59.76"N	74° 3'7.90"W
25	Modena	Ulster	29-Sep	2	58	<i>Robinia pseudoacacia</i> (Black Locust)	41°40'6.74"N	73°59'39.28"W
26	New Paltz	Ulster	29-Sep	3	81	<i>Juglans nigra</i> (eastern black walnut)	41°42'43.82"N	74° 6'48.75"W
27	New Paltz	Ulster	29-Sep	3	86	<i>Juglans nigra</i> (eastern black walnut)	41°41'30.84"N	74° 7'43.96"W
28	Campbell Hall	Orange	6-Oct	3	71	Deer Fence	41°25'36.84"N	74°14'21.00"W
29	Cuddebackville	Orange	6-Oct	3	71	<i>Corylus avellana</i> (Hazelnut)	41°27'45.22"N	74°36'57.16"W
30	Cuddebackville	Orange	6-Oct	3	74	<i>Corylus avellana</i> (Hazelnut)	41°27'41.78"N	74°36'57.28"W
31	Cuddebackville	Orange	6-Oct	3	77	<i>Corylus avellana</i> (Hazelnut)	41°27'40.97"N	74°36'52.20"W
32	Warwick	Orange	6-Oct	3	76	<i>Acer saccharum</i> (<i>sugar maple</i>)	41°17'31.47"N	74°26'15.06"W



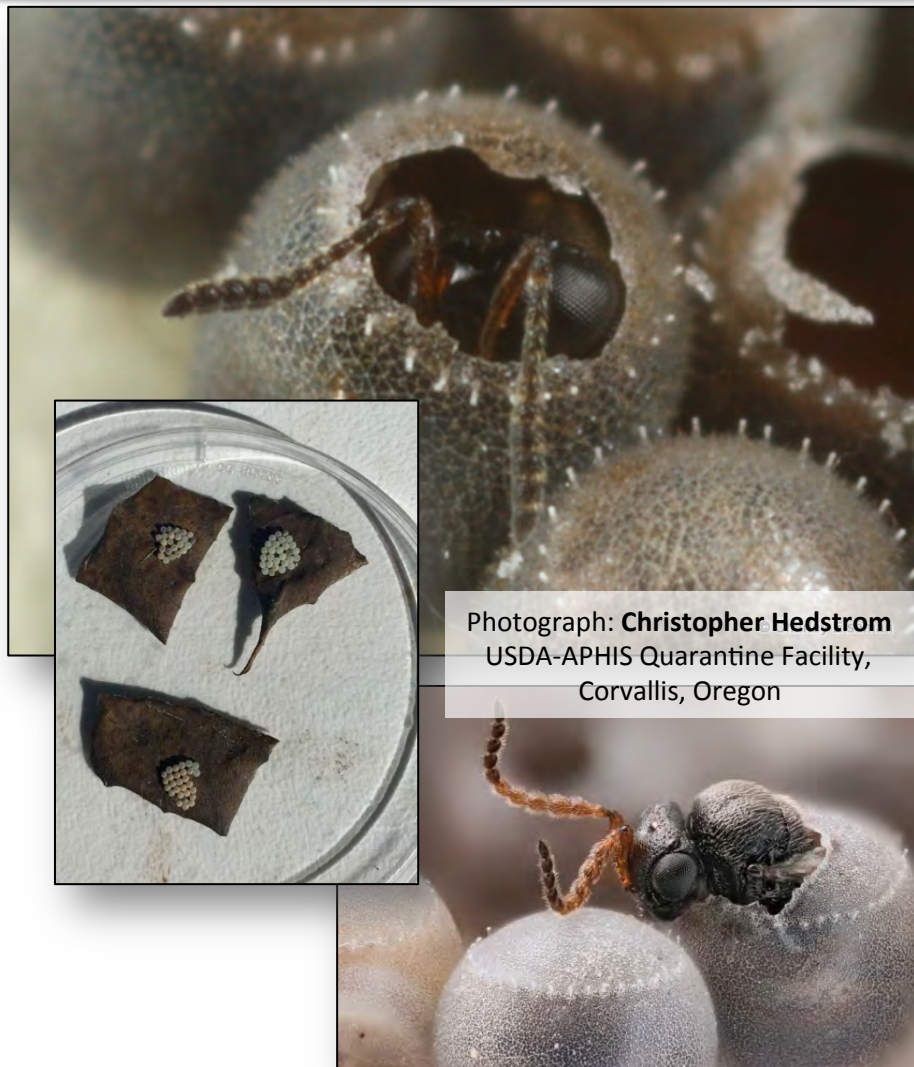
Sentinel Egg Placement



Samurai Wasp Release Sites



Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.



Photograph: Christopher Hedstrom
USDA-APHIS Quarantine Facility,
Corvallis, Oregon

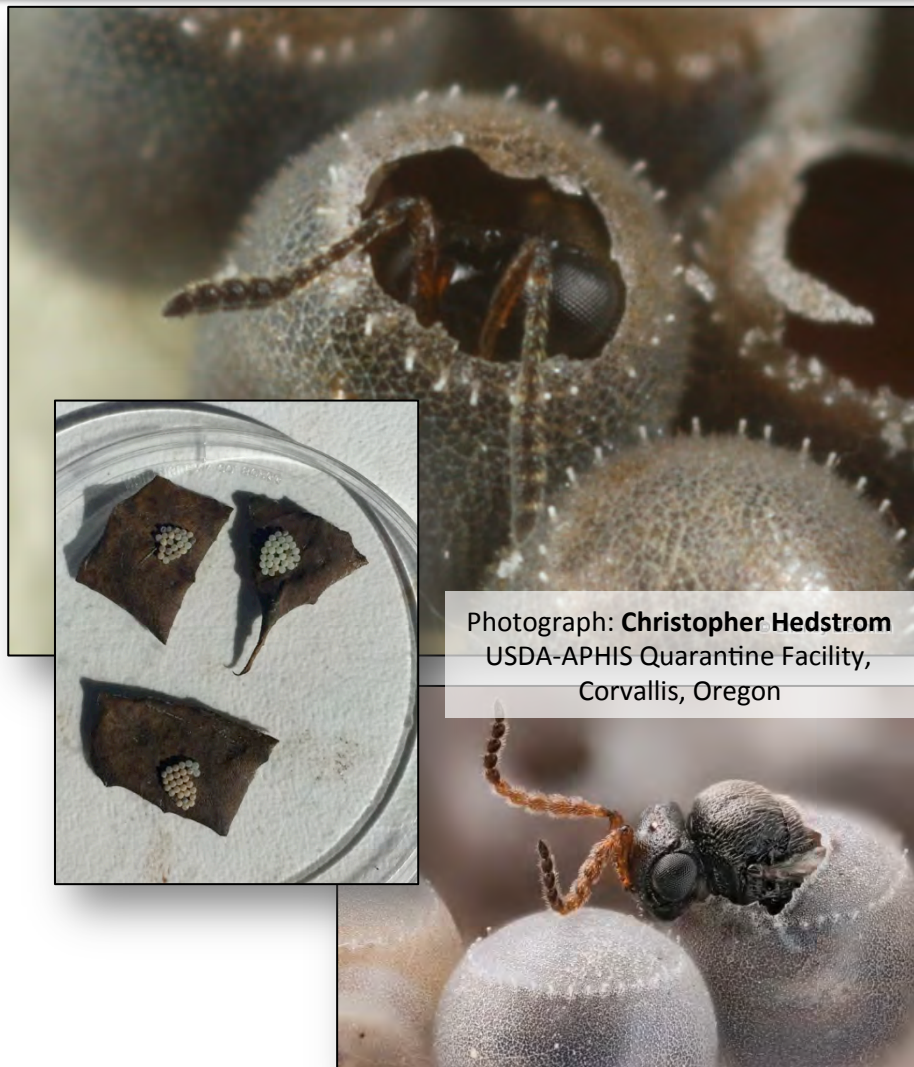
'17 Recollection of Parasitized Eggs

- Parasitized eggs collected in 11 of 32 sites in late October & November to determine % emergence.
- 77% of clusters recovered.
- In 3 of the 11 sites Samurai Wasps was found guarding egg clusters

Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

Recollection of Parasitized Eggs

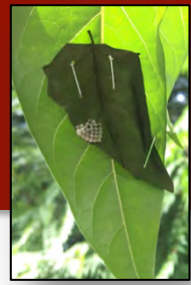
- 168 or 24.4% (N=719) successfully emerge as adults
- 0.7% partially emerged from the egg
- 66.4% of the eggs showing no sign of emergence; parasitized and unsuccessful in development



Photograph: Christopher Hedstrom
USDA-APHIS Quarantine Facility,
Corvallis, Oregon



Release Site Confirmation of Samurai Wasp Using Post Emergence Sentinel Eggs*



- Sentinel eggs were placed 30 meters from *T. japonicus* release site.
- Egg parasitism observed in two of the release sites within 1 week of sentinel egg placement

Site	County	Google Earth Coordinates	Sentinel Eggs Placed (date)
Schutt Orchard Site 1	Monroe	43°11'3.78"N 77°26'56.76"W	9-15-2017
Schutt Orchard Site 1	Monroe	43°11'3.78"N 77°26'56.76"W	9-22-2017
Schutt Orchard Site 1	Monroe	43°11'3.78"N 77°26'56.76"W	10-3-2017
Holly	Orleans	43°13'59.52"N 78°18'7.271"W	10-3-2017

Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

2018 Protocols

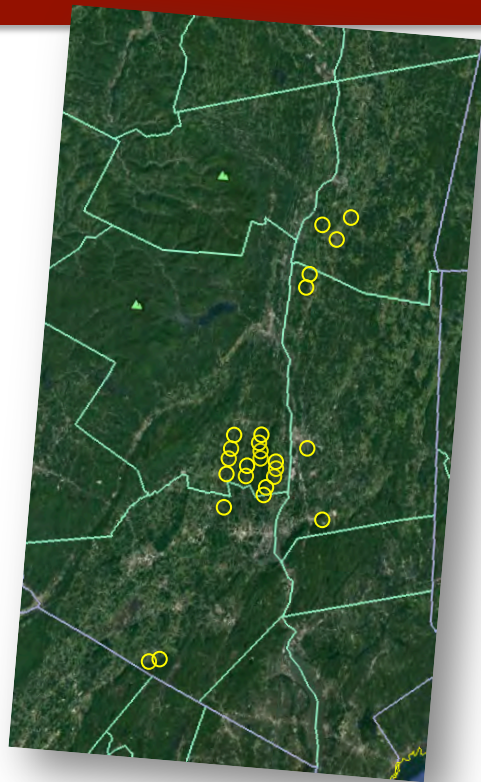
- Weekly sentinel eggs placement in '17 release sites.
- 7d field exposure overnight to HVRL.
- Rear eggs to confirm *T. Japonicus* presence to determine successful establishment.
-



Photograph: Christopher Hedstrom
USDA-APHIS Quarantine Facility,
Corvallis, Oregon



Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.



2018

- Sentinel eggs placement weekly in concentric .
- 7d field exposure overnight to HVRL.
- Rear eggs to confirm *T. Japonicus* presence to determine successful establishment.



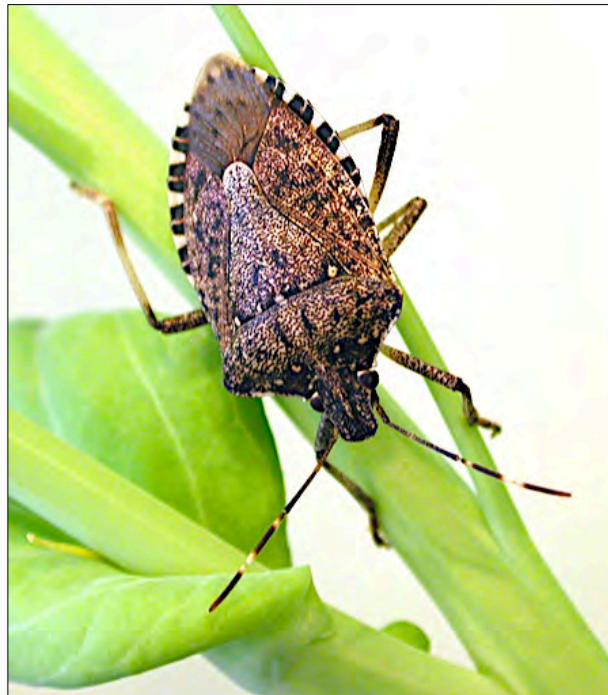
Thanks to the staff at the HVL for all their support:

Research Support Specialist I	Dana Acimovic
<i>Laboratory Technician</i>	Lydia Brown
<i>Research Assistant</i>	Christopher Leffelman
<i>Research Assistant</i>	Lucas Canino
<i>Research Assistant</i>	Ben Lee
<i>Research Assistant</i>	Addie Kurchin
<i>Summer Research Intern</i>	Cameron Fuhr
<i>Farm Manager</i>	Albert Woelfersheim
<i>Administrative Assistant</i>	Erica Kane
<i>Administrative Assistant</i>	Christine Kane
<i>HRVL & NEWA Weather Data</i>	Christopher Leffelman, Albert Woelfersheim

Support from Elijah Talamas (Trissolcus spp. / parasitoid identification)
 NYS Ag. & Mkts, ARDP, Dow AgroSciences, Bayer, NY Farm Viability Institute,
 NYS SCRI, NYS Orchards & Farmers



Questions??



The National March Madness
Citizen Science Project
To Find
The Brown Marmorated Stink Bug

A composite image showing a brown marmorated stink bug at the top right and a Trissolcus japonicus wasp at the bottom right. The wasp is black with a white stripe on its abdomen and large eyes.

Trissolcus japonicus



Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

