**USDA Specialty Crop Research Initiative**

**Annual Report**

**Project Year - Year 5 (ends 8/31/2016)**

**Reporting Institution - Cornell University; Arthur Agnello, Co-PD/Institutional PI** (0.03)

Institutional Co-PIs (FTEs)

Peter Jentsch (0.08) Senior Extension Associate Highland, NY

Charles Bornt (0.02) CCE ENYCHP Specialist Troy, NY

Laura McDermott (0.02) CCE ENYCHP Specialist Hudson Falls, NY

Crystal Stewart (0.02) CCE ENYCHP Specialist Johnstown, NY

Dan Donahue (0.03) CCE ENYCHP Specialist Highland, NY

Faruque Zaman (0.05) Assc. Extension Entomologist Riverhead, NY

Teresa Rusinek (0.05) CCE ENYCHP Specialist Kingston, NY

Maire Ullrich (0.05) CCE ENYCHP Specialist Middletown, NY

Amy Ivy (0.02) CCE ENYCHP Specialist Plattsburgh, NY

Anna Wallis (0.02) CCE ENYCHP Specialist Plattsburgh, NY

Daniel Gilrein (0.01) Association Senior Educator Riverhead, NY

Faruque Zaman (0.05) Association Extension Entomologist Riverhead, NY

Jim O’Connell (0.02) CCE Ulster Co. Specialist Highland, NY

**Key Personnel Trained/Advised**

*WNY Technical Personnel:*

Elizabeth Tee, CCE Specialist, Albion, NY (0.1)

Forrest English-Loeb, SUNY Fredonia, NY (0.05)

Joshua Neal, SUNY ESF, Syracuse, NY (0.05)

*ENY Extension Technical Personnel:*

Sara Rohwer CCE ENYCHP Technician Highland, NY (0.02)

Emelie Morton CCE ENYCHP Technician Plattsburgh, NY (0.03)

Ethan Grudberg CCE ENYCHP Veg Crops Spec Middletown, NY (0.03)

*Hudson Valley Research Lab (HVRL) Personnel:*

Tim Lampasona Field Technician, HVRL Highland, NY (0.05)

Mike Fraatz Field Technician, HVRL Highland, NY (0.05)

Jonathon Binder Field Technician, HVRL Highland, NY (0.05)

Julia Robinson Field Technician, HVRL Highland, NY (0.05)

**Research Products**

**Research Talks, Posters, Meetings/Symposia, and Workshops (Jentsch)**

* Challenges in Managing Invasive Insect Pests and Conserving the Pollinator Complex. *March 22nd , 2016 . Recertification Day, Kingston, NY (60 min.; 56 Fruit growers, fruit extension educators, and private consultants*; *total contact hours = 56)*
* Review of the 2015 Insect Pest Management Season in ENY. *February 17th , 2016 2016 Commercial Tree Fruit Schools, Kingston, NY (30 min.; 208 Fruit growers, extension educators, and private consultants*; *total contact hours = 104)*
* *Hudson Valley Research Laboratory Review for 2015, February 16th  , 2016 2016 Commercial Tree Fruit Schools, Kingston, NY (30 min.; 208 Fruit growers, fruit extension educators, and private consultants*; *total contact hours = 104)*
* Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): What can we expect in 2016 *February 2, 2016 Lake Ontario Winter Fruit Schools,**Niagara County CCE Training Center, Lockport, NY (30 min.; 200 Fruit growers, fruit extension educators, and private consultants*; *total contact hours = 133)*
* Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): What can we expect in 2016. *February 2, 2016 Lake Ontario Winter Fruit Schools,**Newark Garden Hotel, Newark, NY (30 min.; 200 Fruit growers, fruit extension educators, and private consultants*; *total contact hours = 133)*
* Emerging Insect Problems On Tree Fruit In Eastern New York. *January 8th , 2015 Long Island Ag. Forum,**Suffolk CCC, Riverhead, NY (30 min.; 36 Fruit growers, fruit extension educators, and private consultants*; *total contact hours = 18)*
* Emerging Invasive Insects in Eastern NY, ICS Full Scale Exercise, Fire Training Center New Hampton, NY July 21st , 2015

**Research-Oriented Websites and Digital Products**

**[Jentsch, Agnello]**

* EDDMaps website for on-demand access to threshold-based tree fruit producer assistance in BMSB management decision-making. <http://www.eddmaps.org/bmsbNY/>
* Bergh, C., A. Acebes-Doria, T. Leskey, R. Morrison, B. Short, G. Krawczyk, J. Walgenbach, **A. Agnello**, **P. Jentsch,** G. Hamilton, A. Nielsen, B. Blaauw, V. Walton, N. Wiman, C. Hedstrom, P. Shearer, and B. Beers. 2016. Integrated Pest Management for Brown Marmorated Stink Bug in Orchard Crops. 4 pp. <<http://www.stopbmsb.org/orchard-crops>>

**Research Publications (Jentsch)**

* Research and Extension Activities at Hudson Valley Research Laboratory for 2013 – 2016 <https://blogs.cornell.edu/jentsch/files/2015/11/16-HVRL-Report.Red_.Sz_.-1tqpf9e.pdf>

**Extension and Outreach Products**

**Extension and Outreach Products**

**Extension Talks, Meetings, and Workshops (Zaman & Gilrein)**

Presentation in meetings and conferences where BMSB was discussed (presented by Dan Gilrein, Extension Entomologist and Faruque Zaman, Associate Entomologist, CCE-Suffolk, NY):

* And There's More! Other Invasive Pests of Woody Plants. Eastern Branch ESA. January 4, 2016. Philadelphia, PA. 45 attendees
* Pest Planning for 2016. LI Arboric. Assn. January 12, 2016. Riverhead, NY. 45 attendees
* Hot (Pest) Topics from a Hot Summer. LI Horticulture Conf. January 21, 2016. Upton, NY. 43 attendees
* New Pests and Serious Threats. PCA of Long Island. January 28, 2016. Smithtown, NY. 86 attendees
* Certified Nursery &Landscape Prof Training. February 11, 2016. Holtsville, NY. 16 attendees
* NYS Dept of Ag Hort Inspector training. February 24, 2016. Albany, NY. 24 attendees
* Brooklyn Landscape Gardeners. February 29, 2016. Brooklyn, NY. 53 attendees
* Farmingdale College class: Pests of ornamental plants. February 29, 2016. Farmingdale, NY. 16 attendees
* Train the trainer, a talk to Master Gardeners. April 27, 2016. Riverhead, NY. 32 attendees
* Long Is. Arboricultural Assn Twilight Meeting (Entomology Research Update). May 24, 2016. Riverhead, NY. 45 attendees
* NSLGA Bayard Cutting Arboretum – talk on landscape pests. July 19, 2016. Greatriver, NY. 42 attendees

**Extension-Oriented Websites and Digital Products (Jentsch)**

The ‘Jentsch Lab’ web site (<http://blogs.cornell.edu/jentsch/>) produced 21 Extension and Outreach Publications included topics:

* BMSB: A Vanishing Act. [August 1, 2016](https://blogs.cornell.edu/jentsch/2016/08/01/bmsb-a-vanishing-act/). <https://blogs.cornell.edu/jentsch/2016/08/01/bmsb-a-vanishing-act/>
* [BMSB: Bifenthrin Section 18 Renewal in New York for 2016](https://blogs.cornell.edu/jentsch/2016/07/14/bmsb-bifenthrin-section-18-renewal-in-new-york-for-2016/) <https://blogs.cornell.edu/jentsch/2016/07/14/bmsb-bifenthrin-section-18-renewal-in-new-york-for-2016/>

Over the past 12 months the blog site has recorded 9,739 visits, with 5,732 unique

visitors, 15,076 individual page views averaging 2 pages / visit for 1:02 min. per visit time average. The majority of visitors are from the US (7,500), 4797 from direct subscribers, 3810 from Google searches, with worldwide outreach to visitors from Brazil (14), Canada (532), China (60), UK (69), France (51), Iran (172), Serbia (86), South Africa (28), India (206), Australia (43), Greece (60), Italy (77), Spain (43), Indonesia (21), Mexico (51), Germany (94), Romania (4), Turkey (86).

**Extension and Outreach Publications**

During the 2016 growing season, BMSB information was published in the weekly “Fruit and Vegetable Newsletter” published by Cornell Cooperative Extension of Suffolk County distributed to 235 growers and trade representatives.

* F. Zaman: Fruit and Vegetable Newsletter article, “Brown Marmorated Stink Bug (BMSB) Update”, 4 April 2016
* F. Zaman: Fruit and Vegetable Newsletter article, “Brown Marmorated Stink Bug (BMSB) Update”, 5 May 2016
* F. Zaman: Fruit and Vegetable Newsletter article, “Brown Marmorated Stink Bug (BMSB) Update”, 9 June 2016
* A. Agnello: Scaffolds Fruit Newsletter article, "Bifenthrin Section 18 for BMSB Re-Authorized", 18 July 2016
* D. Donahue: "Tree fruit E-alert" references to BMSB were made on: 09/24/15, 07/19/16, and 08/04/16.

**New Leveraged/Complementary Resources (HVRL)**

(Jentsch , P.) 04/15/15 to 03/31/17. New York Farm Viability Institute for $99,614. Increasing the Efficacy and Economic Viability of Trap and Kill Systems for Spotted Wing Drosophila Management and Brown Marmorated Stink Bug in NY Vegetable and Fruit Production

(Jentsch , P., Lampasona, T.) 04/01/15 to 3/31/16 NYS Ag & Mkts CCE Columbia County for $63,197. ‘Monitoring and Management Strategies for the Invasive Spotted Wing Drosophila and Brown Marmorated Stink Bug in the Hudson Valley of NY.’

(Jentsch , Peter; ) 03/01/14 to 11/30/15 Agricultural Company Gifts/Grants, $15,000.

Field Insecticide Trials with Apple, Pear, Small Fruit

(Jentsch , P., Lampasona, T.) 04/01/15 to 3/31/16 NYS Ag & Mkts ARDP, $22,456 Development of Pest Management Thresholds and Management Strategies for the Invasive Brown Marmorated Stink Bug, Halyomorpha halys (Stål): (Pentatomidae) In Commercial Tree Fruit in the Hudson Valley of NY.

(Jentsch , P., Lampasona, T.) 04/01/16 to 3/31/17 NESARE, $14,977.00 A Behaviorally Based Approach To Managing The Invasive Brown Marmorated Stink Bug, *Halyomorpha halys.*

**Media Contacts and Press Coverage**

* [Cornell entomologists take fight to invasive bugs crippling NY crops](http://nysaes.tumblr.com/post/147453825841/cornell-entomologists-take-fight-to-invasive-bugs) (Image credit) <http://nysaes.tumblr.com/post/147453825841/cornell-entomologists-take-fight-to-invasive-bugs>

**Grower/Stakeholder Cooperators**

* Citizen Science Outreach for Public Engagement and Education:

Continue to develop Citizen Science Outreach Project for Invasive Insect Pests.

Continue use of iPhone for ‘live, digital and GPS enabled image submission to determine the presence of the Brown Marmorated Stink Bug populations in NY State. Work with over 450 CS participants to map BMSB population spread throughout NY using iMapInvasive.org on demand mapping system. Maintain contact with survey participants yearly to query their impressions of BMSB population spread in the Hudson Valley.

**Regional trapping study:** [Jentsch] Work with NYS tree fruit, vegetable growers and private consultants, trap data was collected from 22 sites in eastern and western NY from orchards and vegetable fields in 11 Counties. Seasonal pheromone trap data was entered into EDDMaps for tree fruit growers to access on-demand, county-based information, utilized for threshold-based decision-making in sites above a 10 adult per trap threshold (Spreadsheet and graphs attached). Subscribers to the Jentsch Lab blog site were provided updates on BMSB activity with management updates and recommendations.

[McDermott/ENY Commercial Hort Program] The 2016 production year has been very quiet across the entire eastern NY region. There was only one single BMSB adult caught at the Yonder-Valatie site very early on, but nothing since then, although it’s been reported that a couple of southern Orange county locations may have had a few individual insects in traps in late August. Twenty traps on 18 different farms have been monitored weekly since early April.

**Grower/Stakeholder Cooperators:**

**Long Island**

 Briermere Fruit Farm, Clark McCombe, Northville, NY

 Wickham Fruit Farm, Tom Wickham, Cutchogue, NY

 Halsey Fruit Farm, Jenn Halsey, Milk Pail, NY

 Lewin Fruit Farm, Brian Lewin, Calverton, NY

**Western NY**

 K.M. Davies Fruit Storage, Jim Verbridge, Williamson, NY

 Motts (Dr Pepper Snapple Group), Bob Diemer, Williamson, NY

 Cahoon Farms Packing, Robert Cahoon, Wolcott, NY

 Red Jacket Orchards, Joe Nicholson, Geneva, NY

 Bittner-Singer Orchards, Jim Bittner, Appleton, NY

 H.H. Dobbins Packinghouse, Ward Dobbins, Lyndonville, NY

 Kirby Farm, Bruce Kirby, Albion, NY

 Haylett Farm, Ronald Haylett, Albion, NY

**Hudson Valley**

 Allen Ochs Orchard, 4 Ochs Lane, Warwick NY

 Jack Pennings Orchard, 161 State Route 94 S., Warwick NY

 Amy Hepworth, Hepworth Farms, Marlboro NY

 Leonard, Steve and Brad, Clarke; Clarke & Prospect Farms, Milton NY

 Jeff, Jenny and Joel Crist; Crist Brothers Farms, Monroe NY

 Vito, Joel and Bill Truncali; Truncali Farm, Marlboro, NY

 Doug Glorie; Glorie Farm & Winery, Marlboro, NY

 Fabio Chizzola; Westwind Orchard, Accord, NY

 Chuck Mead, Mead Orchards, Tivoli, NY

 Josh Moranthau, Fishkill Farm, Fishkill, NY

 Farm Hub (formerly Gill Farms), Hurley, NY

 Ken Migliorelli, Migliorelli Farms, Red Hook, NY

 Bob Fix, Fix Bros. Fruit Farm, Hudson, NY

 Russ Bartolotta, Klein's Kill, Germantown, NY

 Pete Chairo, Yonder Farms, Valatie, NY

 Keith Bogdanovitch, Love Apple Farm, Ghent, NY

**Champlain Valley**/**Eastern NY**

 Seth Forrence, Forrence Orchards, Valcour, NY

 Dan Wilson, Hicks-Wilson Orchard, Granville, NY

 Kevin Bowman, Bowman Orchard, Rexford, NY

 Bob Rulfs, Rulfs Orchard, Peru, NY

 Sam Dyer, Dyer Farm, Plattsburgh, NY

 Dan Wilson, Hick's Orchard, Granville, NY

 Tim Korona, Korona Korn & Vegs, Amsterdam, NY

 Samascott Orchards, Kinderhook, NY

 Ethan Ball, Schoharie Valley Farms, Schoharie, NY

 Tim Stanton, Stanton's Family Farm, Feura Bush, NY

**Additional Project Information, Details, and General Comments**

[Jentsch]

**Maintain Colony of BMSB for Field Studies:**

* Efficacy studies using the newly developed insecticide Closer (sulfoxaflor; Dow AgroScience) were tested using dilute handgun applications in the field at highest labeled rates compared to Bifenthrin SC at highest labeled rates applied to apple. BMSB nymphs and aduts were placed onto newly treated fruit throughout the season using caged insects placed on fruit in the filed to determine degrees of feeding (anti-feeding efficacy) and mortality.

* **Determining The Complex Of Native And Invasive Predatory And Parasitic Arthropods Of BMSB Eggs In Southeastern NY State:** An eight-week study beginning in late July was initiated to study BMSB egg predation and parasitism in the Hudson Valley. Two sites with historically high BMSB populations were chosen on two SE NY farms in both Orange and Ulster Counties. Using 6 newly laid BMSB egg clusters exposed to -80C for 2 hours, eggs were stapled to the undersides of foliage of *Ailanthus* altissima for 72 hours and returned to the lab, held at 72oF under 75% rH with 14D:10L for observation. Emergence of parasitoids were assessed with species closely resembling Trissolcus japonicus submitted to USDA Beltsville Maryland for confirmation ID.

**Pheromone Blend Trapping Study:** A 6-week study to evaluate 6 different blends of lures for BMSB traps were conducted in cooperation with USDA-ARS under the direction of Brent Short.

**Continuing Pheromone Based Attract and Kill Trapping Study:** An 8-week study to evaluate the placement of 7’ x 14’ netting on perimeter deer fencing to determine the capacity to attract and kill BMSB along the wooded edge of commercial orchards. Netting was sprayed with Bifenthrin at high labeled rates for tree fruit and monitored weekly for BMSB. Results to date along Pink Lady have shown no injury to fruit in perimeter and interior fruit assessments with lowest BMSB populations observed since 2011. These studies will be continued in 2017 with perimeter only applications of insecticides to the orchard.

**Pheromone Based Attract and Kill Trapping Study:** An 8-week study to evaluate the placement of 7’ x 3’ netting along the urban wooded edge of citizen scientist homes to determine the capacity to attract and kill BMSB prior to entry into homes. Two types of netting are being studied. One net, manufactured by BASF, is embedded with a pyrethriod while a second is sprayed with Bifenthrin at high labeled rates for tree fruit both monitored weekly for BMSB at the base. Home are assessed by CS of home infestation levels.

[Zaman]

*Summary:* Brown marmorated stink bug (BMSB) now appears to be established in Suffolk County. However, the population was extremely low in the tree fruit orchards in 2016. As of August 29, we found only two adult BMSB in 4 traps placed in early May in 4 peach and apple orchards in the eastern Long Island. Both BMSB catches were in a trap set in a north Suffolk peach location, nothing captured from the south Suffolk. About 20 BMSB adults have been reported from the residential landscape in eastern Long Island particularly from Riverhead and adjacent area. We are in the process of fruit evaluation at harvest.

*Project Reports (objectives 1.3.2):*

*Determine BMSB invasion pattern into new habitats****:*** Cornell Cooperative Extension of Suffolk County joined with the Cornell University collaborators to monitor brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), populations on Long Island. The BMSB population on L.I. agricultural farm was first detected in 2012. It is believed that the population has been introduced from the west of the Long Island. However, the invasion pattern on the island was never studied before 2015. The objective of this study was to identify BMSB presence in the new locations and assessing the impact on tree fruit production. In the early season (May, 2016) four BMSB traps were placed in four tree fruit (peach, apple) locations of the eastern Long Island covering both North and South fork. Single trap was set in each location near the forest border adjacent to a 35-acre peach, a 10-acres apple and peach, a 22-acre and 40-acre apple orchards. Each traps was baited with an enhanced MDT lure (known as “Rescue” lures from Sterling International, Inc., Spokane, WA). Baited traps were set in the field on 8th May and will continue till 30th Sept. Traps are checked weekly for BMSB adults or nymphs. Lures were changed after every 6 weeks.

The first BMSB capture was recorded on June 21, 2016 (Calverton, Suffolk Co. NY, block: peach). During the entire season two BMSB males have been captured in four traps. The average number of BMSB/trap/season was 0.5 which is slightly much lower than 2014 (1.50) and 2015 (1.75). Beside trap captures, about 20 BMSB adults were reported from residential landscape and homeowners in the eastern Suffolk County.

**3-minute Observations:** Sampling was conducted in and around one peach and one apple orchards on eastern Long Island, inspecting for presence of BMSB life stages (adults, nymphs, eggs). Sampling was carried out using 3-minute visual observations of foliage and fruit from 10 randomly selected trees in the three outside rows of each orchard. Herbaceous and woody vegetation adjacent to the orchard sites was similarly inspected, checking 10 randomly selected spots along wooded borders. Single sampling was done in July 27, 2016. No BMSB adults, nymphs, or eggs were found. Three brown stink bug adults were found in one apple orchard and 2 on non-orchard vegetation.

**Tree Fruit Scouting**: In the past several years during late summer to early fall, an intensive fruit damage survey was done in apple and peach orchards on eastern Long Island. The number of samplings (2 - 6) per orchard was selected based on the size of each orchard. Sampling was conducted by randomly selecting 5 trees each from interior (middle of the orchard) and exterior (outer 3 rows) portions of the orchard. A total of 250 fruits (10 trees, 25 fruits per tree) were visually inspected per sample. As of August 29, we have a total of 2,500 peaches were inspected. Only 5 peaches were found damaged by some kind of stink bug. Damaged fruits were not attributed to any particular stink bug species. We will do apple scouting in the next two weeks.

[Agnello]

Trap captures on regional farms and host habitat sites were extremely low all season. The first BMSB found in pheromone traps in WNY were taken July 29 in Albion, with marginal numbers appearing each succesive week until Sept. 1, when 36 total were captured. In Wayne Co., only 2 BMSB were trapped (Williamson), on Aug. 30. None were found in any other traps in WNY, the Champlain Valley, or the Capital District.

[McDermott/Bornt/Wallis/Ulrich/Rusinek/Donahue]

Over the years, because commercial educators were “tuned-in” to Stink Bug territories, damage and management, staff in the Cooperative Extension system who were responsible for educating home-owners and gardeners were also exposed to the issues surrounding this pest.  In many cases, the commercial staff not only consulted with the community horticulturalists but instructed programs and/or wrote newsletter articles specifically for the home audience.   This heightened awareness and education on the subject from identification to home management strategies increased knowledge by the public as to their presence, and that chemical management was not an effective strategy for the home-owner.