

The Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) (Pentatomidae) in New York State.

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In the fall of 2010 several key areas of study that included a survey of the present population levels of brown marmorated stink bug (BMSB) in a non-agricultural urban landscape, and the monitoring of this insect in agricultural commodities throughout the Hudson Valley and Long Island region of NYS were undertaken.

Our principal objective was to develop efficient monitoring strategies of migration patterns of the BMSB from non-agricultural hosts to tree fruit. We began by surveying urban overwintering sites throughout the state through the use of citizen science based program. Beginning 1 November 1 2010, Cornell Cooperative Extension Master Gardeners Program in cooperation with Cornell Cooperative Extension (CCE) regional specialists began regional collections of urban BMSB populations made by homeowners, which began a statewide monitoring program to establish baseline populations of BMSB in non-agricultural landscapes. During the fall and winter of 2010 we submitted a number of 'Most Wanted' articles to regional newspapers throughout the Hudson Valley, specifically requesting BMSB specimens from readers. Two major newspapers in Kingston (Kingston Freeman, Ulster Co.) and Nyack (LOHUD, Orange, Co.), NY ran the article in both print and digital formats. Statewide CCE Facebook pages also posted articles, which were subsequently picked up by blogs and secondary digital news formats. Individuals interested in submitting specimens were provided embedded text links enabling access to a web based PDF form for submissions to which participants could print and provide information on specimen details including location, address, reply e-mail for us to offer a formal response on the identification.

Specimens were mailed to the Hudson Valley Laboratory in Highland, NY for identification, verification and pinned for future reference. Over 90% of all insect submissions were confirmed to be BMSB. From this survey thus far we've received over 500 insect specimens from 235 locations in 31 counties throughout the state; 50.4% from Ulster, 11.9% from Dutchess, 8.5% from Rockland and from Orange Counties (Figure 1). In the fall of 2011 we submitted a 'Citizen Science Project' article to Westchester, central and western NY, encouraging the general public to submit to us *digital images* using phones with GPS capability, imbedding images with Lat./Long. data to help us monitor the spread of BMSB through out the state. Thus far from this survey we've received over 126 responses containing 73 insect 'image' specimens from 24 NYS counties. Only 71.0% of the images were confirmed BMSB with 22.2% being western conifer seed bug, 1.6% brown stink bug, 0.8% box elder bug and 0.8% other insect species. We used this data to create a map of BMSB presence in NY State <http://hudsonvf.cce.cornell.edu/bmsb1.html> (Figure 2).

Recent studies on BMSB host preference have shown the insect to have a very diverse host range with observations of its presence on over 300 N. American plant species (Nielsen, A. L., and G. C. Hamilton. 2009) (Figure 3). Researchers in W. Virginia and Maryland evaluated the presence of BMSB on 51 plant species during the mid-season for egg masses, nymph and adults shown in Figure 2. Observations demonstrated the presence of BMSB along commodity edge in many of these deciduous trees but not in nearby commodities. In the Hudson Valley we also observed

BMSB on three varieties of deciduous trees in Orange and Ulster Counties yet not in commercial tree fruit as shown in Figure 3. In this survey we monitored 3 species of deciduous trees known as hosts of BMSB that border commercial tree fruit production sites in 5 min. limb jarring and tapping evaluations during Mid-September. We observed on *Ailanthus altissima*: 58 nymphs & adults in a pome and stone fruit orchard in Warwick, Orange County; on *Acer saccharum* - Sugar Maple: 51 nymphs & adults in Marlboro & Highland in Ulster County; and on *Fraxinus americana* - American Ash: 15 nymphs & adults in Highland, NY in Ulster County. These populations of BMSB were not observed moving to commodity but were observed moving to overwintering sites to nearby homes. This demonstrates that the population can exist on deciduous trees during years where food requirements are met. It may be that in the mid-Atlantic, populations were very high and environmental conditions being very dry, prompted the insect to move into commodities early, causing severe season long injury to tree fruit.

Our second objective was to develop standard monitoring tools and standardized damage assessment methods to determine the extent and severity of BMSB feeding injury. The need to refine decision support tools such as economic action thresholds for use as triggers for insecticide application management is an essential component to managing this pest. Initial monitoring efforts was exclusively intended of tree fruit orchards in the northern region of the Hudson Valley, from Washington south through Orange counties, east to the forks of Suffolk county for the spring of 2011, using 2 comparative trapping methods. We employed pheromone baited Tedders traps and 'Lepidoperan Black Light traps'. Trapping was sponsored through funding initially from ARDP, then expanded with funds from NYS Ag & Mkts, providing resources to purchase materials and construct traps for a total of 78 pheromone trap sets and 8 black light traps throughout the fruit growing regions of NY including grape growing regions of Niagara, Finger Lakes and Eastern Long Island.

The pheromone presently used for trapping BMSB, methyl (E,E,Z)-2,4,6-decatrienoate, derived from *Plaudia stali*, has proved to be ineffective at capturing the overwintering BMSB adult during the early and mid 2012 growing season using Whalon modified tedder's traps. This may be due to the lack of aggregation response in BMSB during the early season periods of reproduction and oviposition. However, the black light traps have successfully been used to capture adults moving from deciduous hosts to commodities in New Jersey. As we did not capture BMSB in pheromone or black light traps from spring through to mid-August, we began scouting and assessing damage to tree fruit using intensive scouting and fruit evaluation techniques as the season progressed so as not to miss potential damaging low level populations. Trapping and scouting along tree fruit wooded borders and interior trees to determine the presence of BMSB have to date provided 1 BMSB egg cluster on grape (Marlboro), 3 BMSB egg cluster on apple (only at the HVL using intensive high levels of foliage evaluations) and 200 adults and 66 nymphs in traps, Ag and non-Ag plants. All landscape captures have come from trap or surveys in Orange and Ulster Counties with a single observation of BMSB on grape in Geneva, NY. The highest concentrations of BMSB on commodity have been observed on green and red bell pepper in Marlboro, NY. Although a small number of BMSB have been observed on Ag commodities, to date we have only observed a single monitoring site of BMSB field populations of an agricultural commodity that would warrant pest management control measures, in organic pepper, Marlboro, NY. Highest field observations on non-agricultural plants have been on Tree of Heaven, *Ailanthus altissimus*, American Ash and Sugar Maple in Highland, NY and Tree of Heaven, *Ailanthus altissimus* in Warwick, Orange County. As *A. altissimus* is a predominant host of BMSB, our focus for the 2012 season will be on monitoring this host for BMSB and survey its potential movement into agricultural commodities (Figures 3 & 4).

Figure 1. BMSB presence by NYS County of verified mail in submissions.

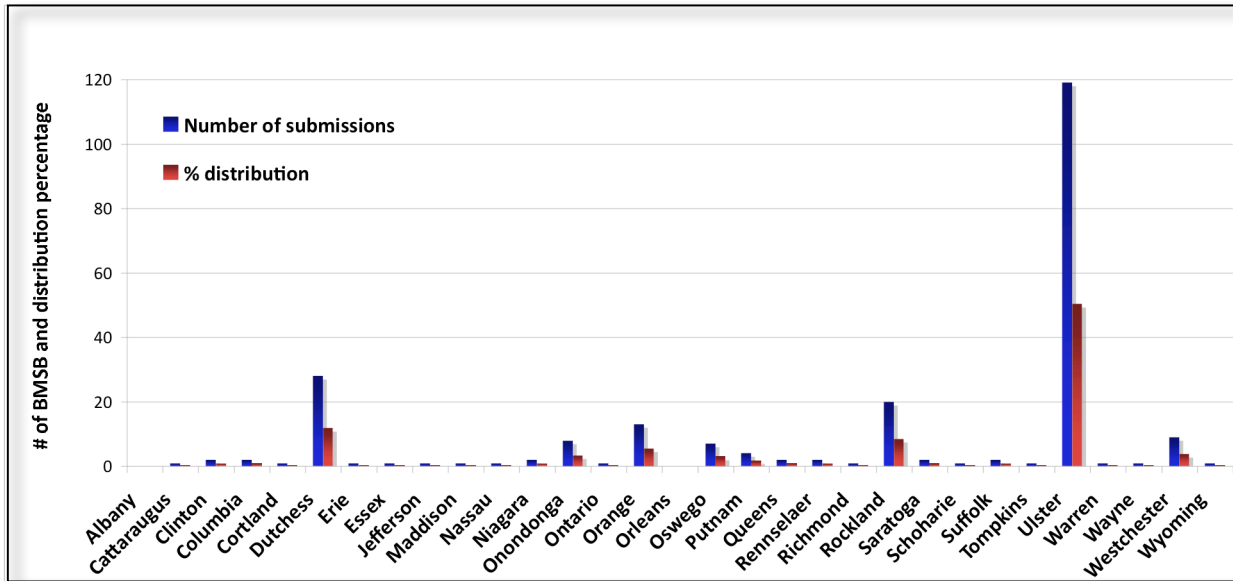


Figure 2. Confirmed BMSB specimens by zip code and image confirmation locations

