

Traps and Trap Placement May Affect Location of Brown Marmorated Stink Bug (Hemiptera: Pentatomidae) and Increase Injury to Tomato Fruits in Home Gardens

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Stink Bug Traps

- Many stink bug traps are available commercially
- Most claim to attract, capture, and kill stink bugs
- Some claim to reduce stink bug damage on plants

- Volunteers were recruited
- 2 list-serves were used
- One sent to master gardeners affiliated with University of Maryland Extension and another sent to faculty, staff, and students in the Department of Entomology
- 32 were chosen for the study based on geographic location



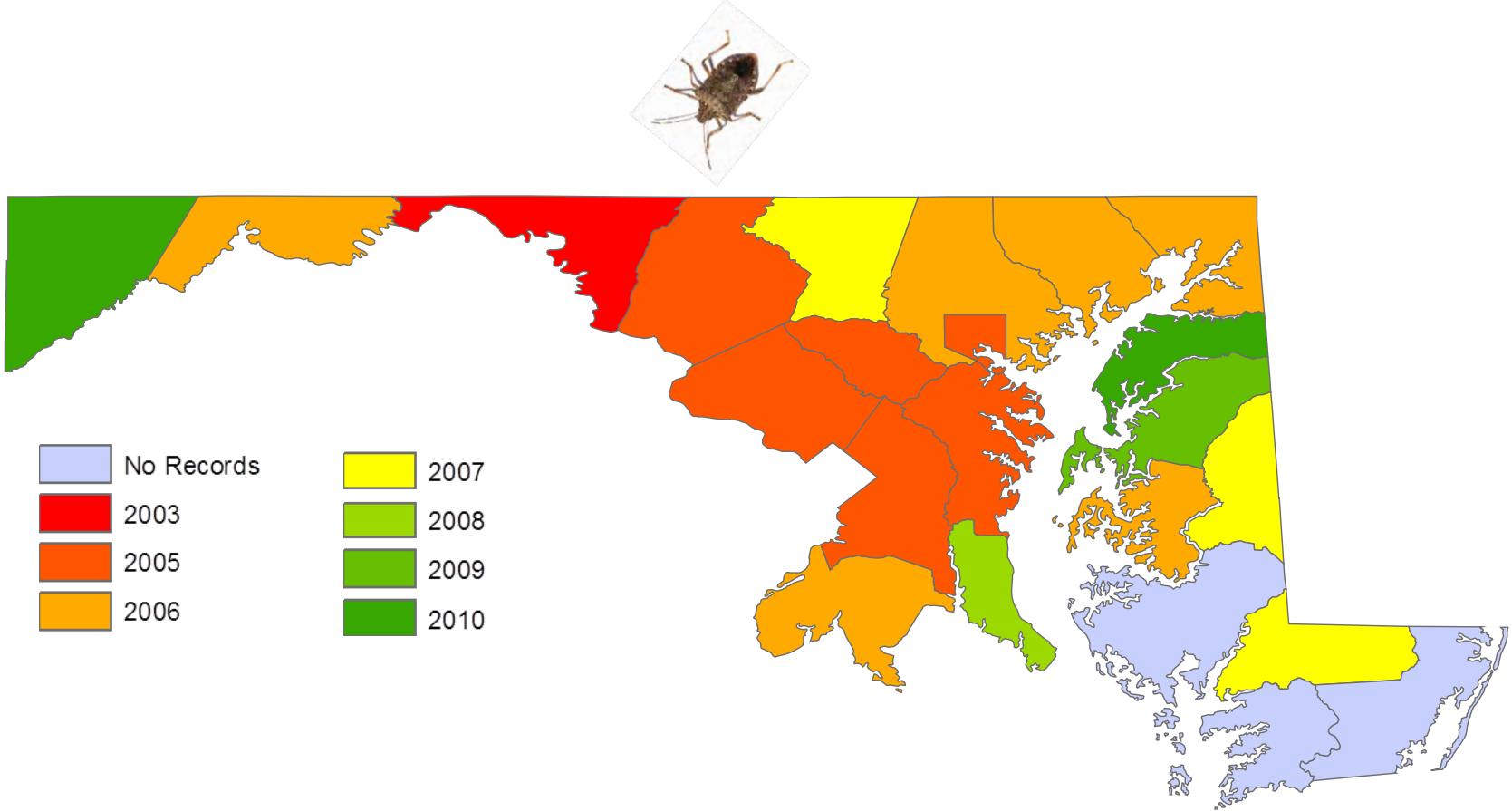


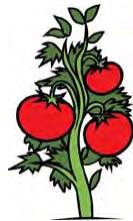
Figure 4. First records of brown marmorated stink bugs (BMSB) in Maryland counties and Baltimore City. Colors show the first record (across all three datasets; see Table 1) by year, and counties with no records to date are indicated in gray.

The geographic location by county and numbers of cooperators receiving traps and not receiving traps were as follows (trap: no trap):

- Carroll (1:1)
- Harford (3:3)
- Baltimore (0:1)
- Frederick (1:1)
- Montgomery (4:3)
- Howard (1:2)
- Prince Georges (3:3)
- Charles (1:1)
- St. Mary's (2:1)



With Trap



near

far

Without Trap



near

far

Garden Attributes



- Garden plots ranged from 2.3 m^2 to 1004.8 m^2
- Garden size did not differ between those with and without traps (T-test, $P \geq 0.35$).
- Twenty five of 29 gardeners grew crops other than tomatoes and enumerated 65 different crops.
- Average number of plants grown in gardens with traps did not differ from that of gardens without traps (T-test, $P > 0.05$)
- Gardeners with traps enumerated 23 different tomato varieties - Gardeners without traps enumerated 20 different varieties
- Distance between Plants 1 and 2 did not differ for cooperators with and without traps (Wilcoxon Rank Sum Test, $P > 0.05$).
- Number of plants between Plants 1 and 2 did not differ for cooperators with and without traps (T-test, $P > 0.05$).

- Traps were deployed in July 2012
- Traps were located 1 m from one tomato plant at one end of a row (near).
- A second tomato plant, Plant 2, was the one farthest from the trap at the opposite end of the same row (far).
- Cooperators without traps selected a plant at the end of a row and called it Plant 1 and selected a second plant at the far end of the same row and called it Plant 2.



Working with citizen scientists - Is the data accurate?

- Of the 29 volunteers 3 PhDs, 1 PhD candidate, 25 Master Gardeners with 6 - 18 h training
- All received training material (pictures & text)
- Questions - CS or MR verified via email, landlines, and smart phones
- Exchanged information and responded to inquiries > 390 times.
- Digital cameras and smart phones facilitated identification
- Samples were submitted to CS and MR for confirmation.





What and When

- Initial counts of *H. halys* in traps were made on or near 24 July. Subsequent counts were made weekly until the conclusion of the study on 11, September, 2012.
- In addition to monitoring stink bugs in traps, collaborators recorded the number of stink bugs on the fruit, foliage, and stems of tomato plants.



- An assessment of stink bug related damage to tomato fruits was conducted on 4, September 2012.
- Cooperators examined one - five tomato fruits from Plants 1 and 2
- Counted the number of stink bug feeding punctures on each fruit (cooperators were provided with an identification sheet to help them recognize feeding punctures)

Overall,

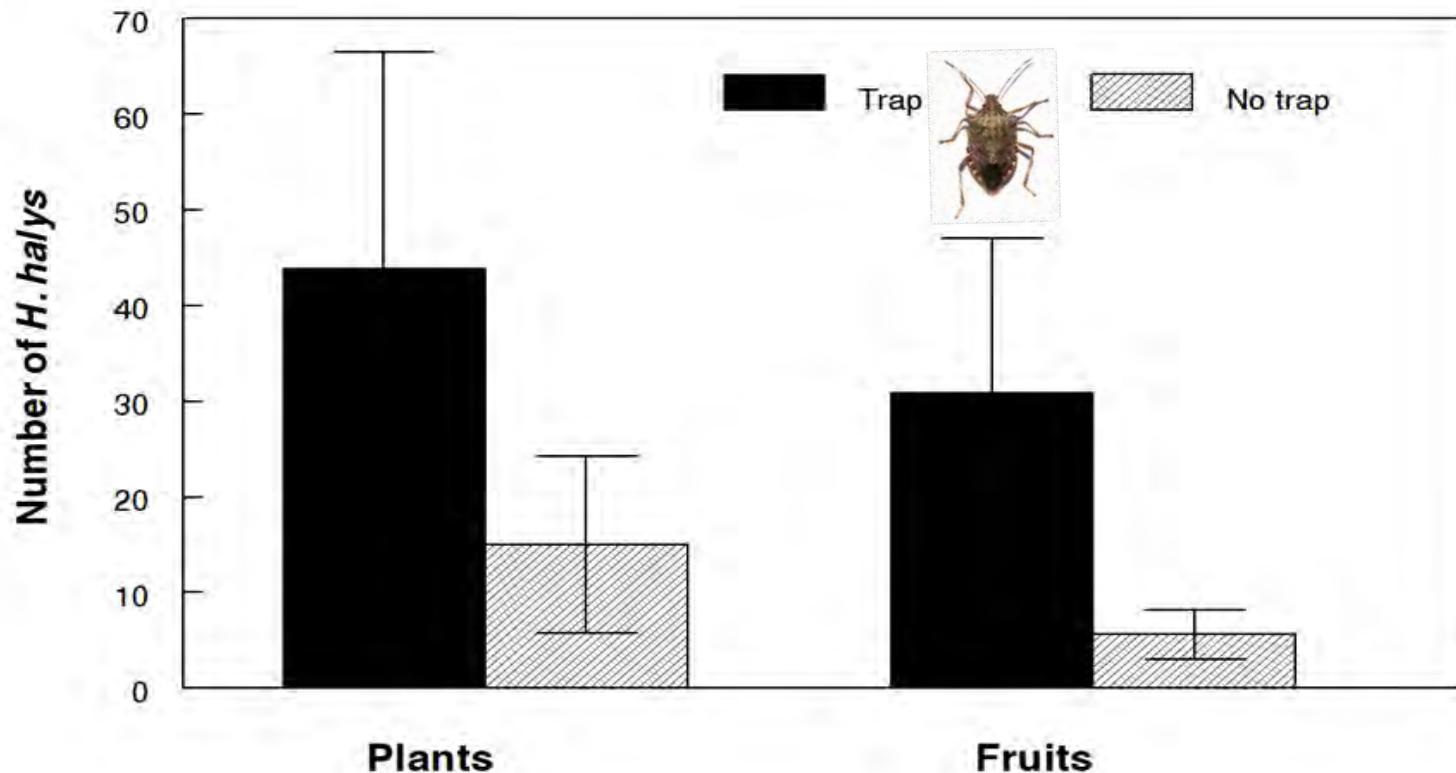
- 15 gardeners with traps collected a total of 4447 *H. halys* during the trapping period.
- The mean number trapped per cooperator was 286.1 ± 89.7 (SE) with a range of 0 to 1223.
- 15 individual stink bugs other than *H. halys* were observed in traps, and these stink bugs are not included in the analysis or discussion.
- *H. halys* were not observed on tomato plants in 33% percent of gardens with stink bug traps or on tomato plants in 36% of the gardens without traps. These proportions did not differ ($\chi^2 = 0.00$, d.f. = 1, P > (2) = 1.00).

Fig. 1. *Halyomorpha halys* nymphs pierce fruit and create feeding punctures and cloudy zones visible on the surface of the tomato

(Photographic credit: Barbara Knapp).

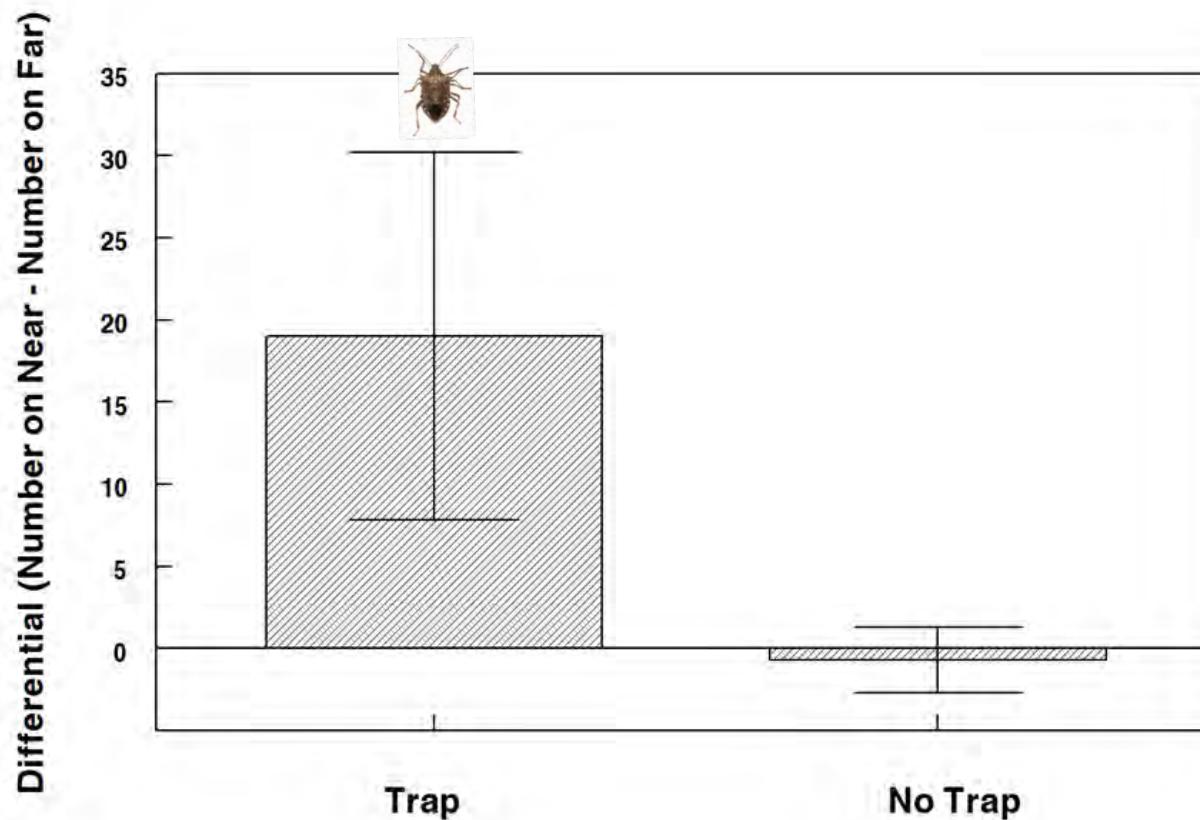


Comparison of Gardens with and without Traps



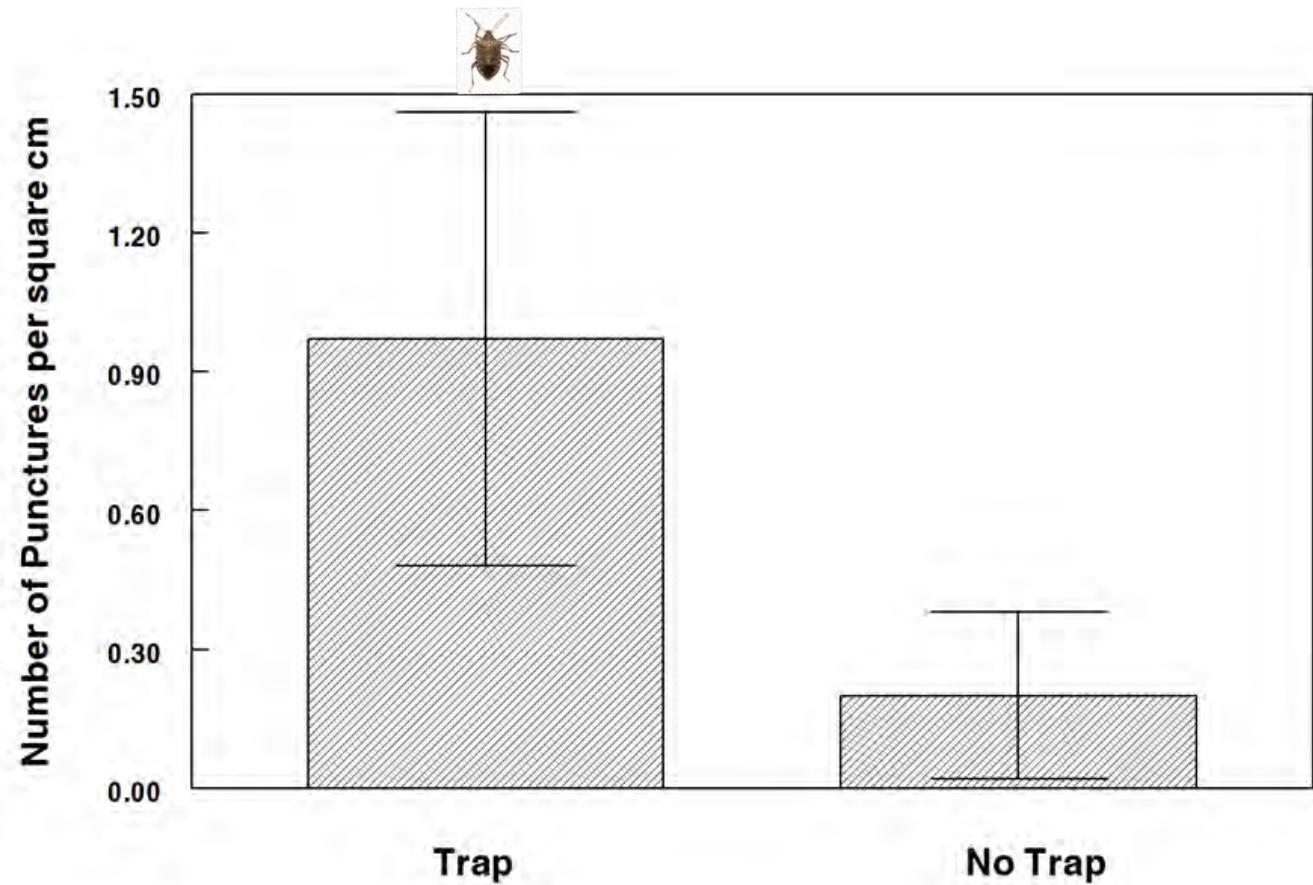
Counts did not differ on entire plants (Likelihood Ratio Test; $\chi^2 = 1.40$, d.f. = 1, P α (2) = 0.24), but were marginally different on tomato fruits (Likelihood Ratio Test; $\chi^2 = 2.94$, d.f. = 1, P α (2) = 0.09). Bars represent means and vertical lines represent standard errors.

Comparison of BMSB on Tomato Fruit near to and far from Trap

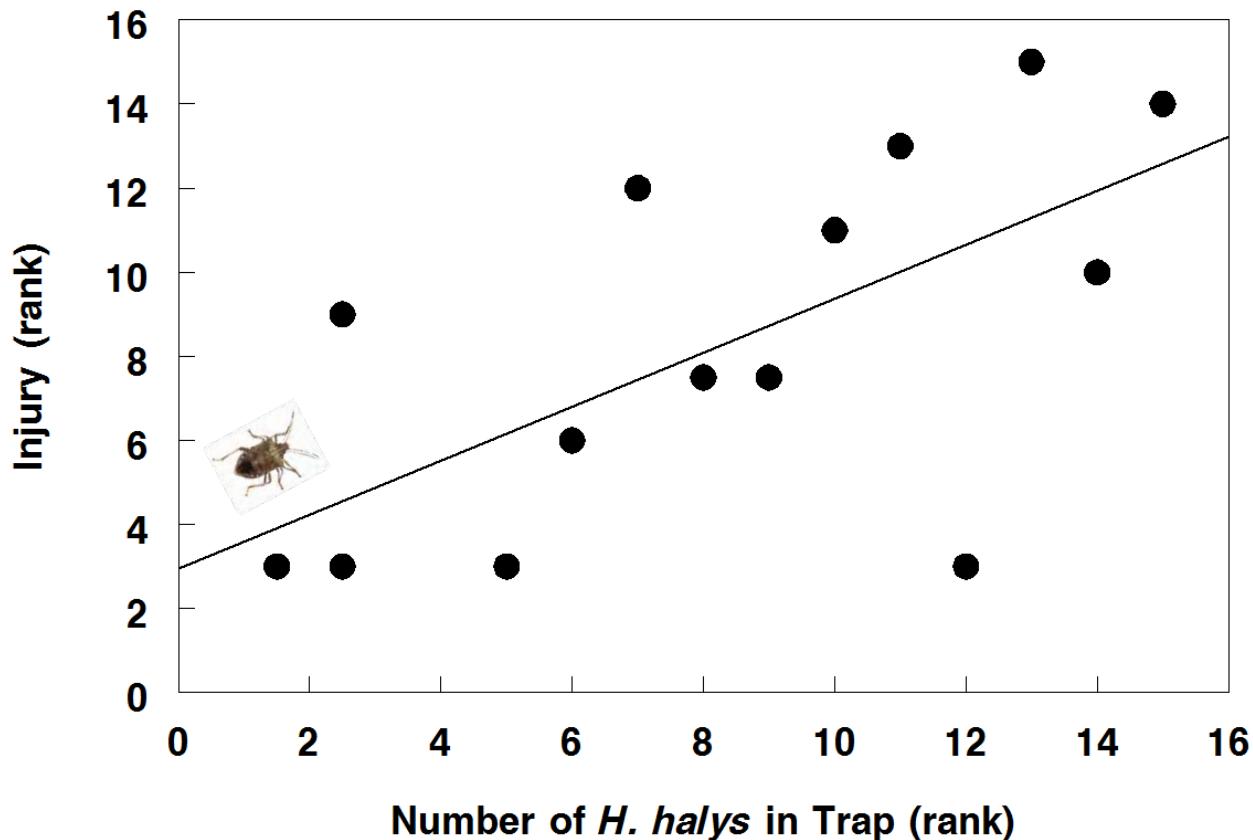


Differential between total numbers of *H. halys* observed on tomato fruits on plants at the end of a row near a stink bug trap compared with the plant at the end of a row far from a stink bug trap. Differentials differed between gardens with and without traps (Likelihood Ratio Test: $\chi^2 = 6.54$, d.f. = 1, P α (2) = 0.01).

Comparison of Injury to Tomato Fruit in Gardens with and without Traps



Number of feeding punctures per square cm observed at the end of eight weeks on tomato fruits in gardens with and without stink bug traps. The number of punctures differed between gardens with and without traps ($Z = 1.67$, $P = 0.05$).



Number of stink bugs in a trap was highly correlated with the average number of feeding punctures (injury) on tomato fruit (Spearman Rank Correlation, $S = 41.97$, $\rho = 0.81$, $P = 0.003$).

Stink Bug Traps

- Gardens with traps had marginally higher levels of stink bugs than those without
- Gardens with traps sustained more fruit damage
- Number of stink bugs in a trap correlated positively to fruit injury in garden
- Plants nearest to the trap housed more stink bugs than those farther away
- Conclusion - we failed to find evidence that stink bug traps reduced stink bug damage on plants





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