

Our 2014 findings: Kudzu bugs persist in Maryland

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The invasive kudzu bug, *Megacopta cribraria*, has proven to be an agricultural pest of soybeans in the southeastern United States. Originally from Japan, these bugs have spread since their introduction to Georgia in 2009 north to Maryland in 2013. Although the range and phenology are well known in the southern US, little research has been done on the biology of kudzu bugs in Maryland. Since Maryland is currently the northern limit of the kudzu bug's known range, we monitored populations to develop an understanding of the phenology of their life stages in the mid-Atlantic region. During summer and fall of 2014 our goals were:

1. Check the persistence and abundance of bugs at previously known sites
2. Create a standard sampling method
3. Monitor sites of expected kudzu bug expansion
4. Determine the phenology of the bugs in Maryland

During 2014, we resampled all sites that were positive for kudzu bugs in 2013. All 18 sites that had kudzu bugs in 2013, with one exception, still had kudzu bugs in 2014. The one site where kudzu bugs were not detected had a reduced amount of kudzu vines. Thus, the county-level distribution of the kudzu bug in Maryland remains the same as 2013 (Fig. 1).

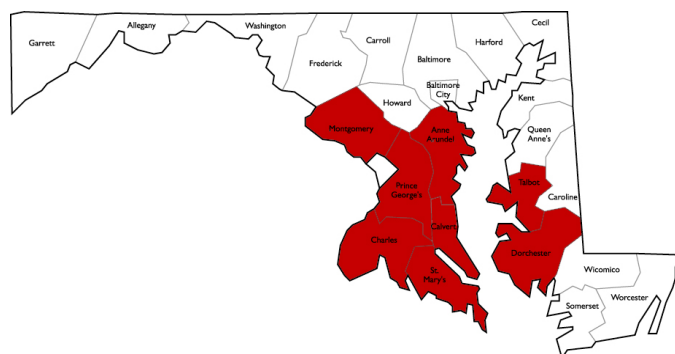


Figure 1: Map of Maryland counties with kudzu bugs in 2014 shown in red.

Based on sampling in 2013, the sites we visited in June and July in 2014 left an impression of reduced numbers of kudzu bugs compared to 2013. The impression may be due to a general trend seen throughout its US range in 2014 in which the kudzu bugs had low numbers in the summer and higher relative numbers in the fall (W. Gardner, personal communication, September 11, 2014). One possible reason for this trend is that the colder than average winter of 2013-14 may have increased mortality of overwintering adults (see temperature patterns in Fig. 2). Fewer surviving adults may have delayed the population growth we expected to see by mid-summer.

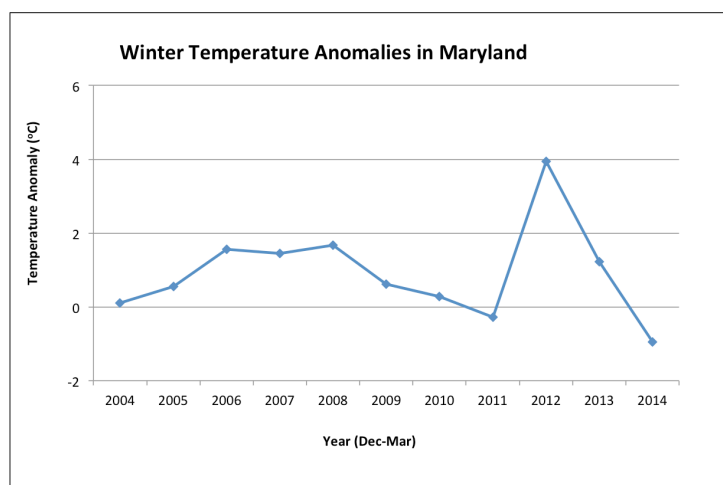


Figure 2. Temperature anomaly (the difference between the observed temperature and the long-term average) during winter months (Dec-Mar) in Maryland for each year starting in 2003/2004. Note that the past winter has been the coldest over the past 10 years, and it was preceded by two of the warmest winters during the same period. (National Climate Data Center, 2015)

We developed a standardized sampling method for kudzu bugs that allowed us to

compare densities of eggs, nymphs, and adults across sample sites and times. Based on research in the southern US, we adopted a two-part sampling protocol. First, we collected 10 sections of 0.5m long kudzu vines from a site, transported them to the lab, and carefully searched for egg masses, nymphs (which range in size and color, and can be difficult to see), and adults. This method allowed for counting of small and hard to find life stages that are often not found in other sampling methods. Second, we swept through the kudzu foliage for a total of 60 seconds, stopping every 15 seconds to count the number of adults and nymphs in the net. This sweeping approach allowed us to reach to higher in the kudzu patch canopy, where we often found more of them, and permitted us to detect a presence

over a large area quickly. We used this approach to sample four sites each week through the summer, and every other week in the fall until kudzu leaves senesced. Two of the sites had kudzu bugs in 2013, while the other two did not but we expected the bugs to colonize the sites in 2014. In fact, we only found kudzu bugs at the two sites with previous populations (Enterprise Road, Prince George County shown in Fig. 3, Top). We found many more bugs this year by September at sites in Calvert County (e.g., Fig. 3, Middle) and one site in

Talbot County (Fig. 3, Bottom). All sites started the summer with low densities but grew quickly by fall. At several of the sites with abundant kudzu bugs, we could easily detect their presence when we first arrived at the site because of their distinctive smell!

Due to the lower numbers of kudzu bug adults in early summer, the phenology of the bugs in Maryland still needs further study. However, a few interesting trends emerged from this season's monitoring, especially information from August through October when kudzu bug populations were found at several sites. August had the highest number of egg masses, September was dominated by nymphs, and October had an equal number of nymphs and adults (Fig. 4). Thus, since there is second peak of adults beginning in October, we can extrapolate that there are most likely two generations of kudzu bugs in Maryland by the resulting two peaks of new adults

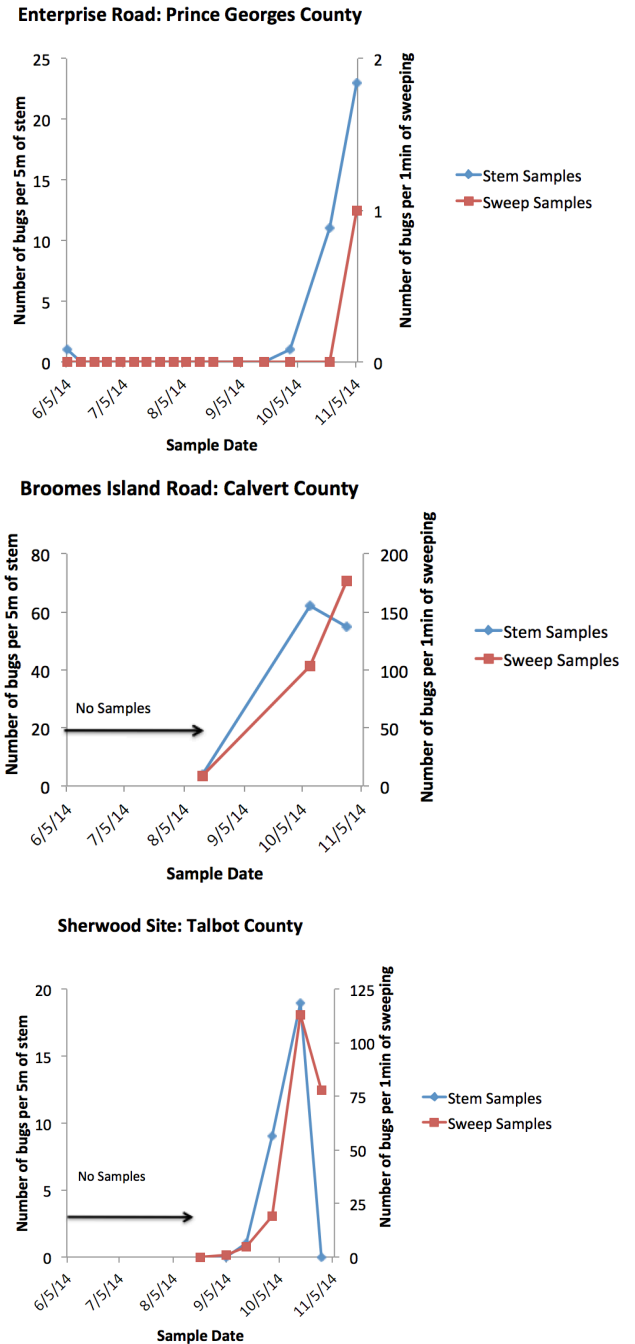


Figure 3. Number of kudzu bugs per stem and sweep samples at three sample sites of kudzu, 2014. Mike Embrey helped with sampling.

during the season (Fig. 5). Furthermore, in comparison to observations in southeastern US, kudzu bugs may have a shifted emergence and population growth towards later in the season as suggested by our findings of mixed life stages persisting into the late fall.

Overall, our observations during 2014 have confirmed that the kudzu bug can survive colder than average winters in Maryland, although its abundance may be reduced during spring and the first half of the summer. We plan to continue to monitor kudzu bug populations during 2015, with the goal of being able to predict the abundance, distribution, and degree-day development for egg laying in the spring. Kudzu bugs may have the potential to expand throughout Maryland and become a pest on soybeans. Knowing their cold tolerance and timing of their developmental stages will aid us in preparing plans for pest management of the kudzu bug.

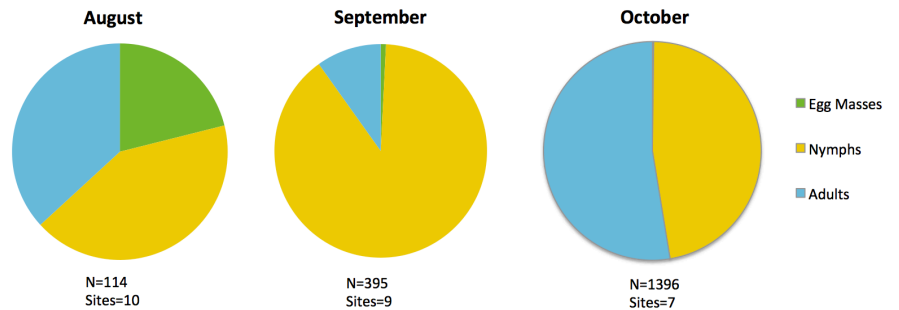


Figure 4. The percentage of the three life stages (egg masses, nymphs and adults) of the total kudzu bugs found by all collection methods for August, September, and October.

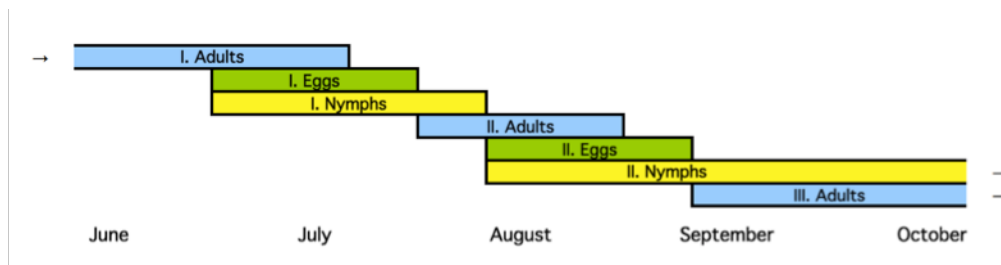


Figure 5. Our hypothesized phenology of the kudzu bug in Maryland based on observations in 2013 and 2014. Research in 2015 will focus on refining the timing of life stages in June and July.