Study of the Small Hive Beetle in Rhode Island: Preliminary Findings and Implications for New England Bees and Beekeepers

Carolyn Fluehr-Lobban, cfluehr@ric.edu (Professor Emerita of Anthropology, Rhode Island College and member of the Rhode Island Beekeepers' Association)

(article derived in part from the 2015 grant report produced by Dr. Geoff Stilwell, Assistant Professor of Biology, Rhode Island College)

It is well-known that American honey bees are at risk with long-term non-sustainable losses of beehives annually reported throughout the US. American beekeepers have been battling various pests since the 1990s weakening the bees, including most notably the varroa mite. However, a more recent threat is the small hive beetle (SHB), an invasive species now established in the southern US states but migrating north and found recently in Rhode Island. Most beehives in the state are comprised of bees imported into the state from producers in Georgia and Florida, and recently from California, with hundreds of packages delivered to the state in the springtime each year.

The first year of a two year study of the Small Hive Beetle (SHB) in the state of Rhode Island has been completed. The presence of the SHB in the state has been observed since 2013 when the former president of the RI Beekeepers Association (RIBA), Ed Lafferty, reported the presence of live SHB larvae in a number of his hives during winter hive checks in that year. Initially reported at the January 2013 RIBA meeting, it was proposed that a study of the SHB be conducted in the state so as to assess its presence and effects in southern New England whose winters were supposed to be sufficiently cold as to suppress any extant SHB populations.

A grant to study the SHB was funded by the Rhode Island Department of Environmental Management for a two year period, April 1, 2015- March 31, 2017, for an assessment of the presence of the SHB in the state. Members of the Rhode Island Beekeepers Association (RIBA) and Rhode Island College (RIC)-- which established beehives for public education on campus in 2011 and which hosts annual Bee Schools-- entered into a collaborative agreement to study the presence and potential impact of this invasive species. The overall principal investigator is Dr. Geoff Stilwell, entomologist in the RIC Biology Department. (1) Fifty participants recruited from RIBA members and Bee School graduates with beehives, yielded an actual sample size of 35 beekeepers who were selected to geographically represent the state's 10 counties and to have SHB Freeman traps installed for monitoring and counting the presence of SHB in their hives. For methodological consistency, undergraduate honors student- researcher Adam Jacques was recruited as the sole person to carry out the installation and monitoring of the 35 traps. Besides the SHB study, another purpose of the study is a first-time documentation and GIS mapping of the state's beehives, thus creating a state-wide data base for quantifying bee populations and their overall health while observing the presence of the SHB (2).

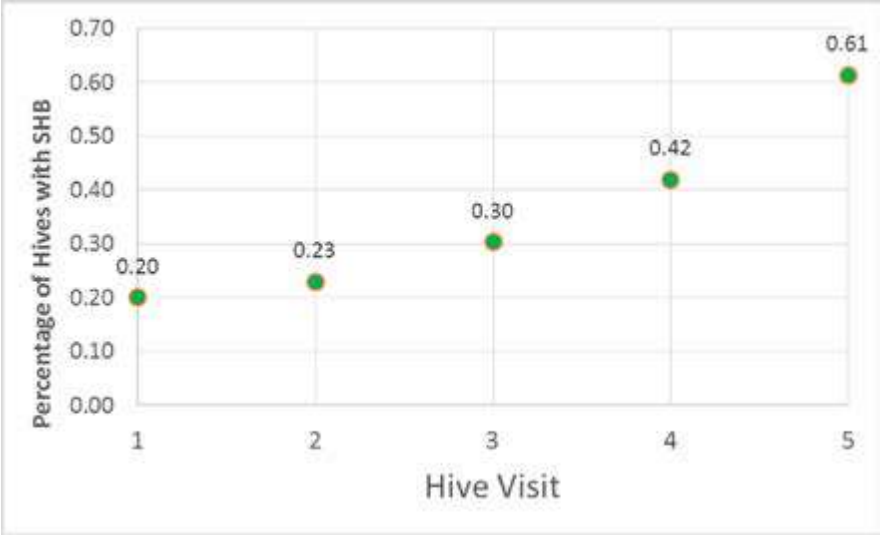
PRELIMINARY FINDINGS

Since the grant was initiated in April 2015, the following activities were conducted:

1. Monitoring of Small Hive Beetles (SHBs) throughout the state during the 2015 growing season; 2. Working with the Rhode Island Beekeepers Association to disseminate information on the SHB; 3) Conducting educational outreach for K-12 students and adults in various forums.

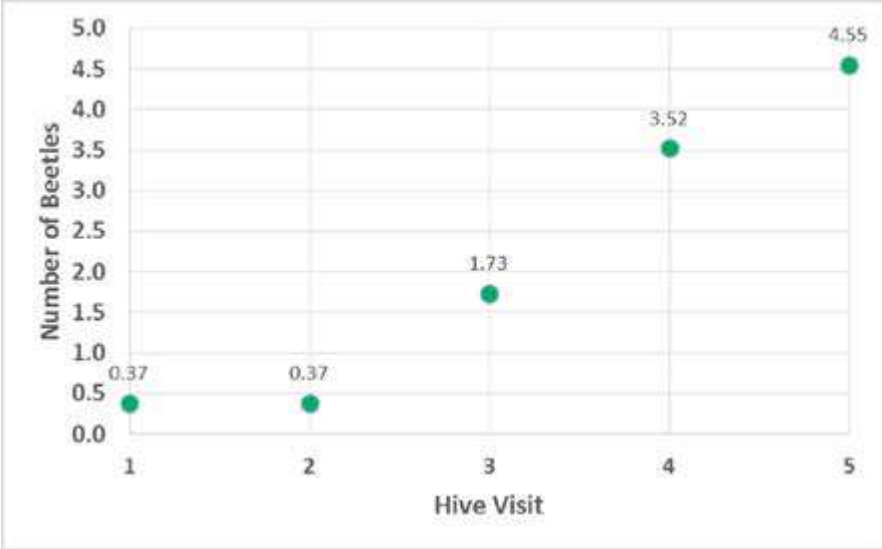
The 2015 Spring and Summer seasons were characterized by an unusually late thaw followed by hot and dry weather. Working with beekeepers who volunteered to participate in the study, the first monitoring season was completed in which SHB numbers and distribution were surveyed throughout the state. For the 35 volunteers, Freeman traps were installed in their hives at the beginning of June and final counts were made at the end of August. Every two weeks the contents of all the traps were collected and analyzed at Rhode Island College for the presence of both Varroa mites along with SHBs.

Thus far, preliminary data shows that incidence of SHBs increased steadily throughout the summer. Twenty percent of all hives were infested at the beginning of June and by the end of August, ~60% of hives contained SHBs (Fig. 1).



[Figure 1. Incidence of SHBs in RI apiaries]

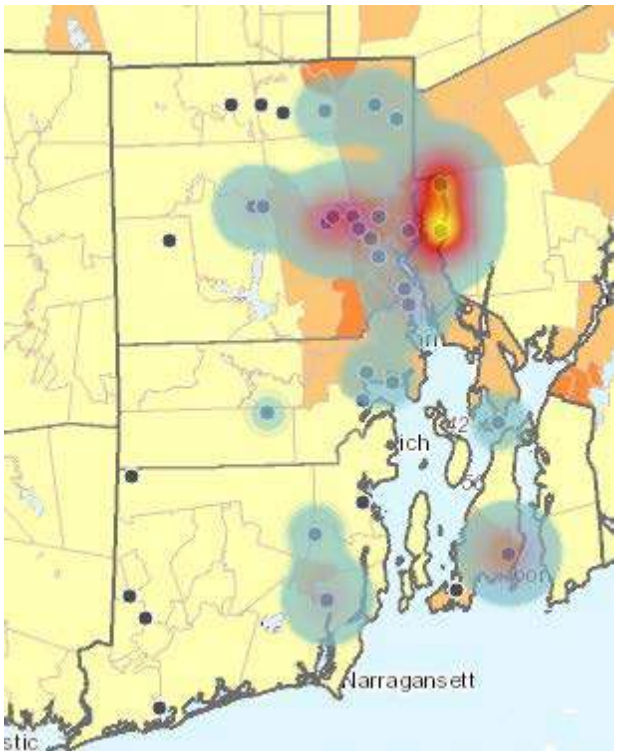
Hives containing >1 SHB were tallied and the fractional incidence is reported among all hives monitored. In hives containing SHBs, the average number collected in the Freeman traps was relatively low on a biweekly basis (Fig. 2).



[Figure 2. Average number of SHBs per hive collected over a two week period. Average numbers ranged from .37 to 4.55 from early June to late August respectively.]

While these numbers may indicate that SHBs are not a significant pest generally, only the SHBs collected from traps were reported and it is quite likely that the total number of SHBs per hive is much greater. Significantly, > 50 SHBs were collected in 4 hives. In these cases, SHBs negatively affected honey production and hive fitness based on reported outcomes from the volunteers. Parenthetically, the author of this article lost a hive, a first year hive from a package originating in Georgia, to a combination of varroa infestation and SHB after the hive failed due to queen loss while our family was away for the month of July.

Thus, if our data is representative of hives throughout RI, ~10% of all hives appeared to be impacted by SHBs. The distribution of SHBs throughout the state was not uniform. Our collected SHB survey data were plotted using Geographic Information Systems (GIS) and as shown in the map below, areas with the highest numbers of SHB roughly correspond to areas with the largest populations or highest population density in the state. This is an important finding because urban beekeeping is on the rise and our data indicate the SHB may be a more significant threat to these hives.



[Figure 3. Heat map depiction of SHB incidence throughout RI during the 2015 growing season. Each of the 35 black dots represents the location of a hive monitored in the study. Red and blue indicate the highest and lowest levels of SHBs respectively.]

Educational Outreach

Conducting educational outreach for RI beekeepers, for K-12 students and adults in various forums were carried out during the first year of the study. Where the SHB was found, mitigation strategies will be employed, assessed and reported to the RI community of beekeepers during the second year of the study. The collaborating organizations, RIBA and RIC, will likewise conduct educational outreach primarily through the RIBA monthly meetings and the annual Bees Schools that are conducted at Rhode Island College, averaging 200 students per year. The main educational activities that occurred during the first year of the study include:

• The RIC hives and Bee Education Center have been a focal point of beekeeping education and outreach. More than 300 students ranging in age from 4 to 18 visited the hives, attended classes, or received instruction about bees and beekeeping. Schools included both elementary and middle schools in the state.

• The Bee Education Center at Rhode Island College also hosted a U.S. Congressman and Senator, and local official have attended various functions at the Center on the RIC campus.

• The Bee School will run classes for 5 weeks starting February 5th and 6th, 2016. Community advertising is underway to increase participation. Segments on the SHB study will be included in

the Bee Schools for 2016 to alert new beekeepers to the growing presence of the SHB in the state. Working with the Rhode Island Beekeepers Association has been the best way to disseminate information on the SHB study. Thus far, the research has been presented at two RIBA meetings, including the fall 2015 annual banquet. Based on that lively discussion, RIBA members indicated that they want to get more involved in this research and we believe the best way to protect our bee populations is through a combination of education and 'active engagement' among members. Thus, we are formulating a plan to include greater participation in active monitoring among members for the upcoming 2016 growing season.

Plans for the Second Year of the Study

One area in which there has been a delay is the implementation of an interactive website which will be used to disseminate information about the SHB in RI. Originally scheduled for the end of 2014, this delay was caused primarily by the grant initiation at a later date than originally planned. Now that the bees are clustering, the winter months will be spent developing and launching the website in preparation for the 2016 growing season. The new goal is to have a live website by March 2016. This will provide time to develop and test an interactive site which can be accessed by beekeepers statewide.

Future Project Plans

Future plans include additional education outreach at a variety of forums including the 2016 Beekeeping classes to include a description of invasive species and how they affect bee populations. We believe strongly that education about bees should also include learning about all the potential threats to bee populations and the fragility of domesticated bee populations throughout the world. There are also plans to disseminate the results of the SHB study in Rhode Island to neighboring states in New England, especially as RI weather and soil conditions may be more conducive to the viability of the SHB in northern states.

Plans for 2016 include expansion of our monitoring of bee populations to include the 2016 growing season, as well as the examination for the presence of the SHB of bee packages that are imported into the state from the southern US and from California. Additional available funds should cover employment of a second student-researcher in 2016. We believe additional and sustained monitoring of bee populations will be the best way to ensure health of the state-wide populations.

(1) Other participants included: Ed Lafferty, immediate past-president of RIBA; James Lawson, RI State Bee Inspector; James Murphy, Sustainability Coordinator, RIC; Carlyn Fluehr-Lobban, RIC Professor Emerita; Adam Jacques, RIC undergraduate Honors student and researcher.

(2) PROJECT TITLE: Protecting Honey Bees from the Small Hive Beetle in Rhode Island. RIDEM Contract # 014-022.

(3) For more information please contact RIC Principle Investigator, Dr. Geoff Stilwell (gstilwell@ric.edu) Educational Outreach responsible persons, Dr. Carolyn Fluehr-Lobban (cfluehr@ric.edu) and James Murphy (Jmurphy2@ric.edu); RIBA president Ed Lafferty, (fruithillapiraies@verizon.net); or RI State Bee Inspector, James Lawson (james.lawson@dem.ri.gov)

Submitted to: *American Bee Journal* [www.americanbeejournal.com; info@americanbejournal.com]; *Bee Culture* [www.BeeCulture.com; info@BeeCulture.com]; Scientific beekeeping, Randy Oliver webpage and blog site http://scientificbeekeeping.com/newsletter]