The Small Hive Beetle, An Emerging Pest In Washington

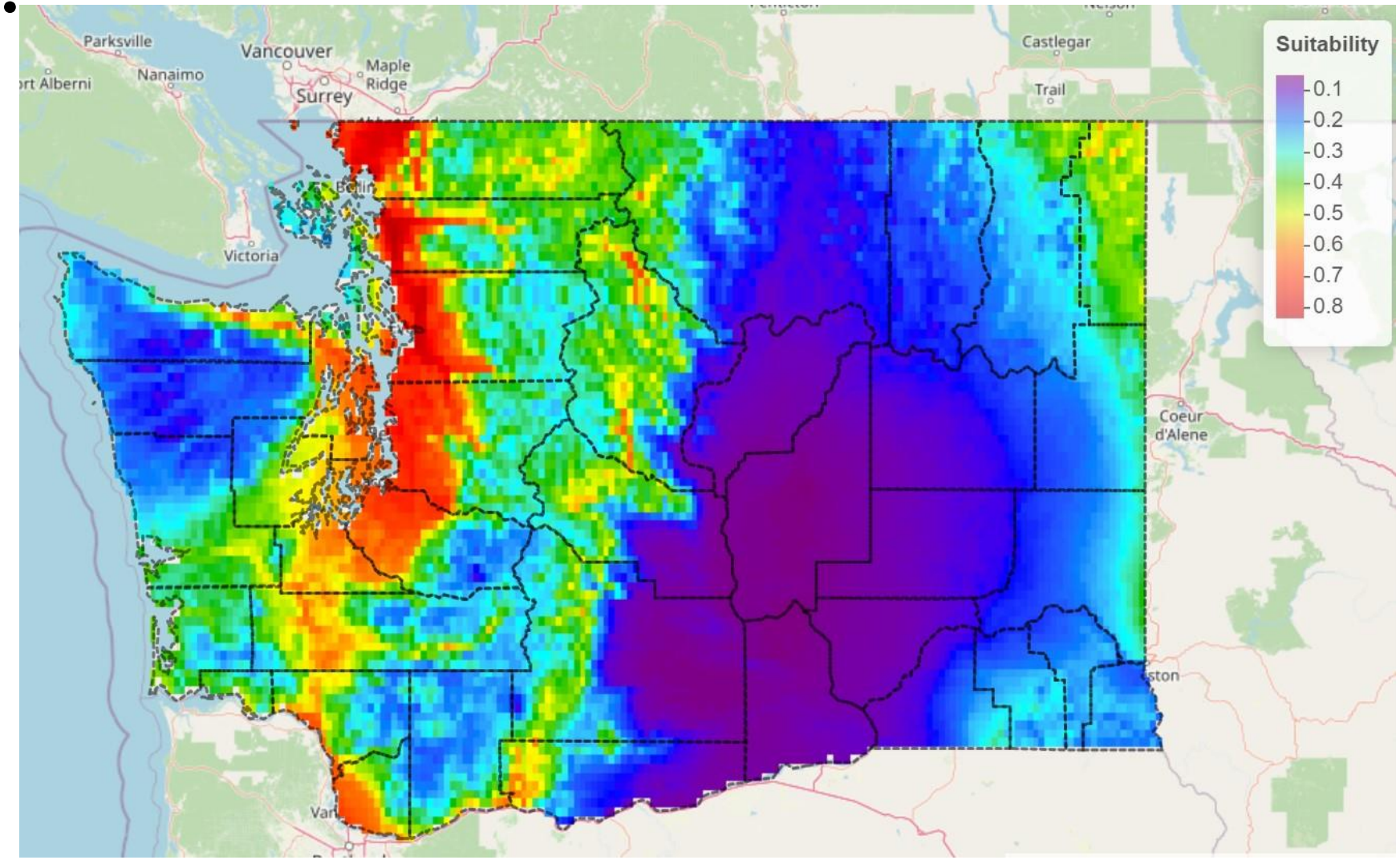
Riley Reed

James D. Ellis, University of Florida, Bugwood.org

Small hive beetles are a common pest in the southern US.

James D. Ellis, University of Florida, Bugwood.org

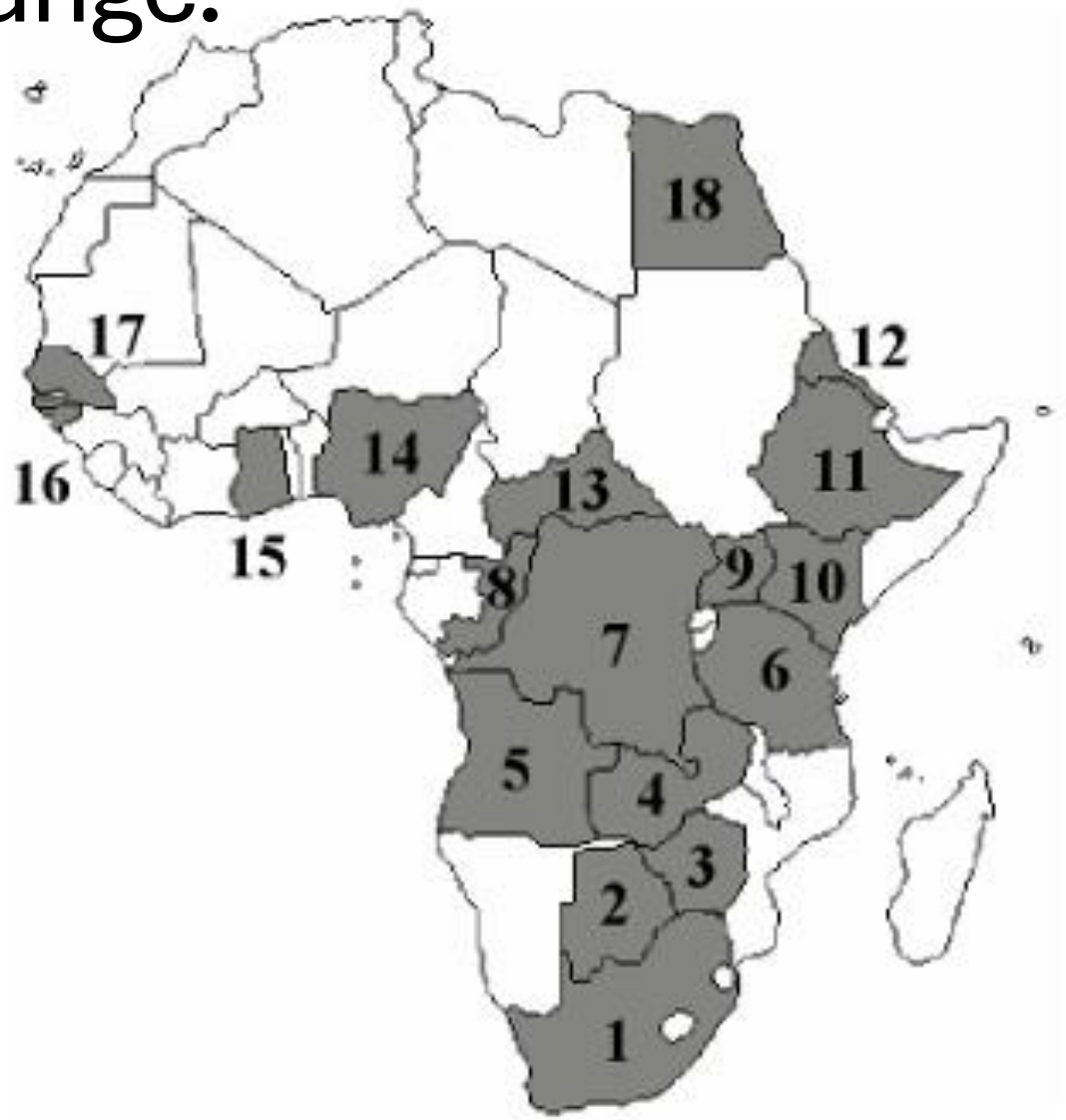
Small hive beetles may become a common sight.



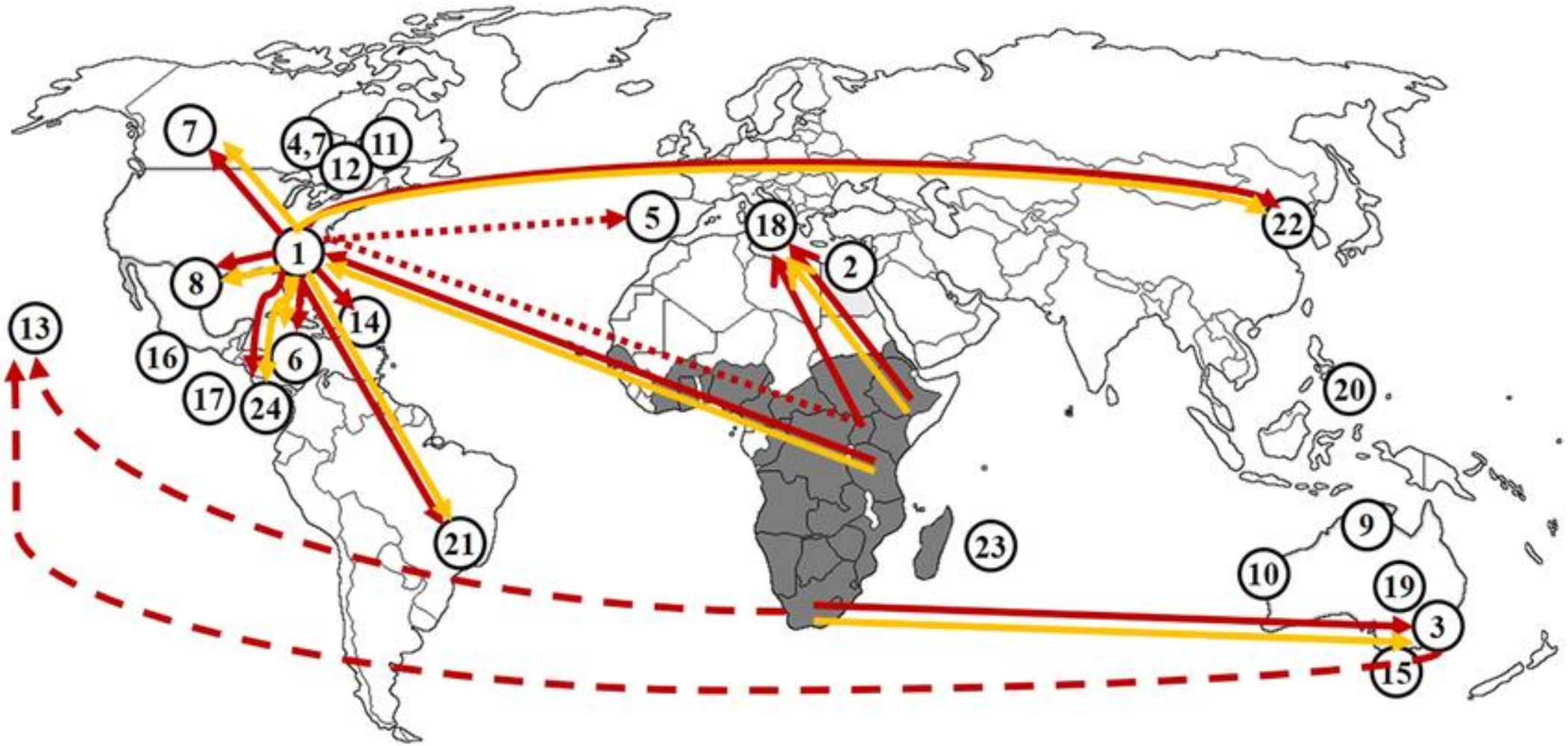
Courtesy of Gengping Zhu

The Spread of Small Hive Beetles

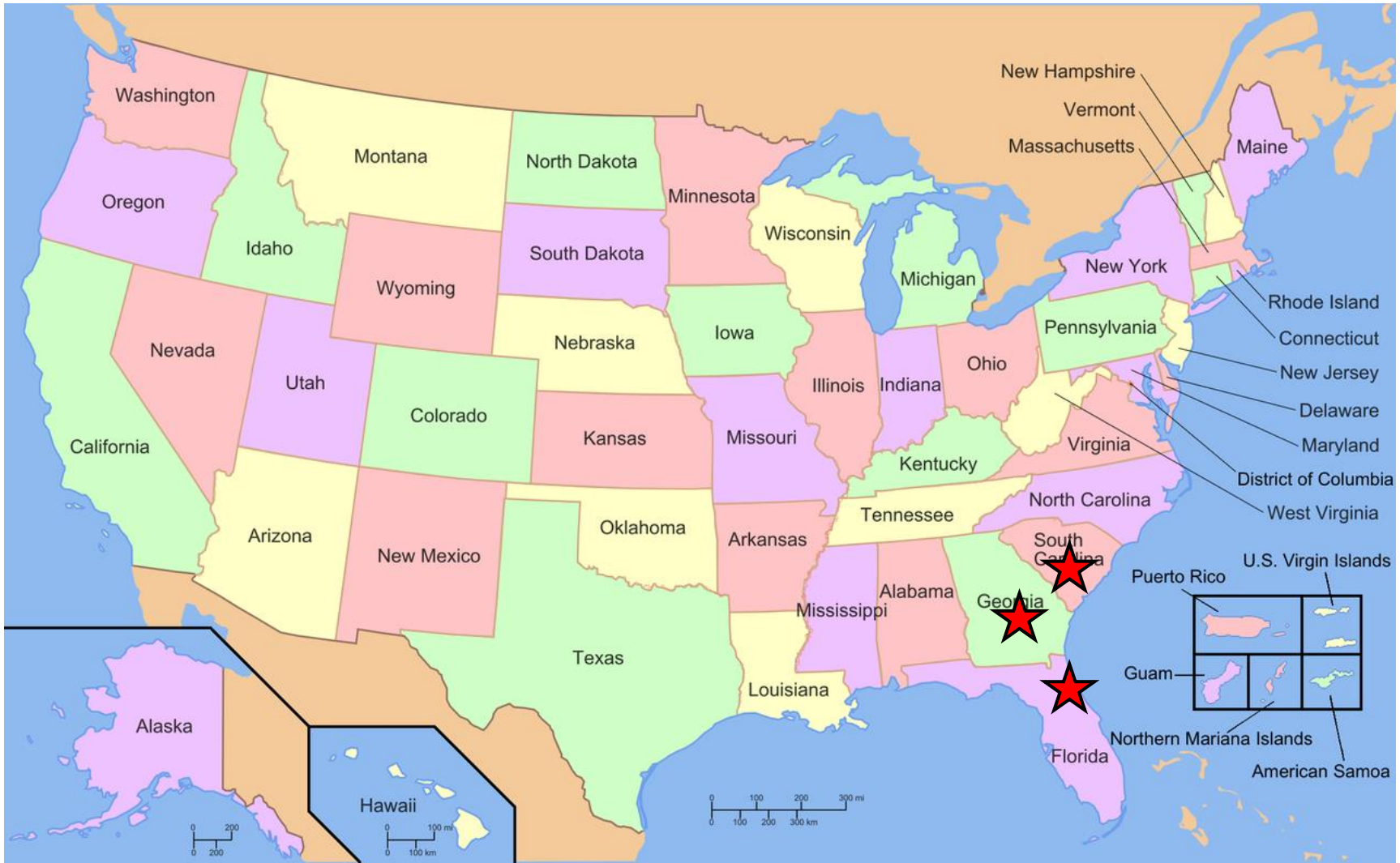
Small hive beetles are only a minor pest in their native range.



Small hive beetles have been unintentionally spread world wide.

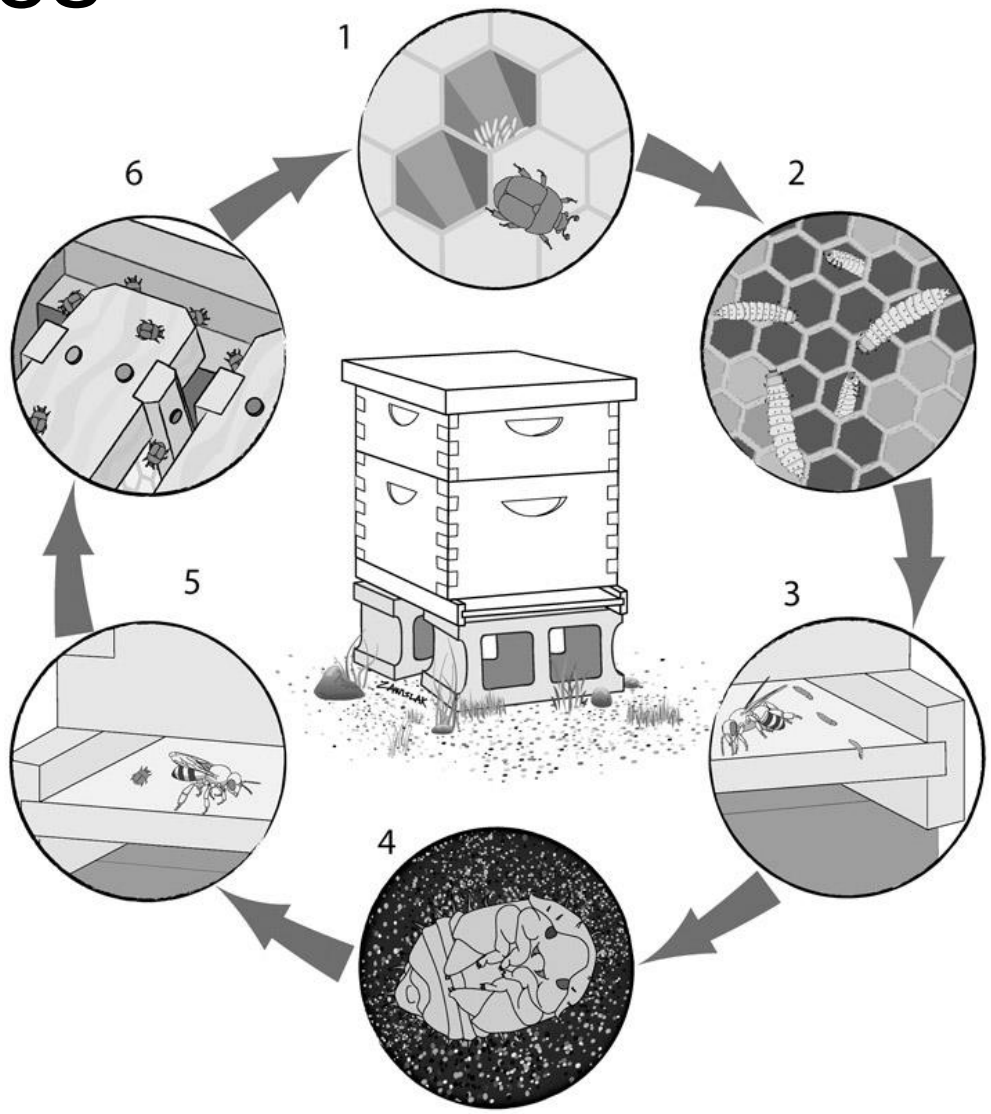


Small hive beetles were first reported in the southeastern states



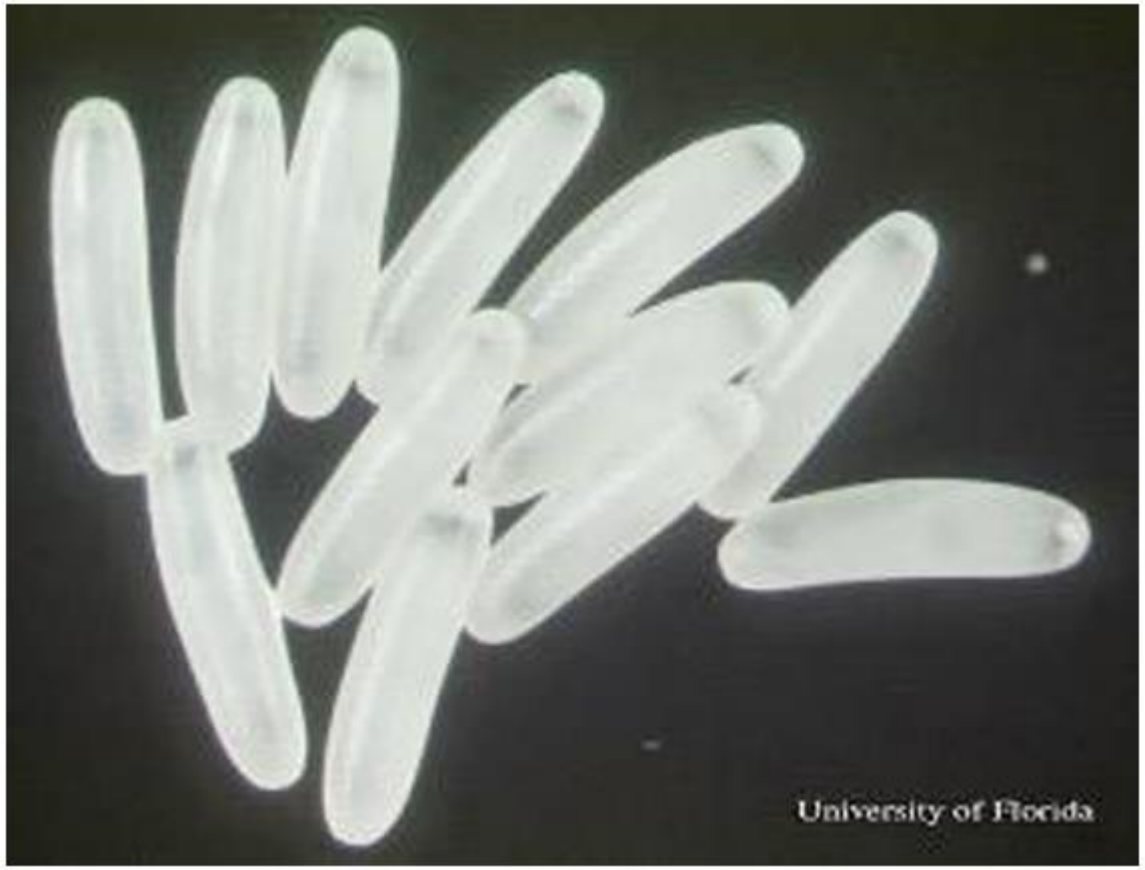
The Life of a Small Hive Beetle

Small hive beetles spend the majority of their life inside hives



Courtesy of Jon Zawislak

Small hive beetles generally lay their eggs in crevices within the hive.



Neumann et al., 2016

Once larvae have finished feeding, they must exit the hive.

Pest and Diseases Image Library, Bugwood.org.

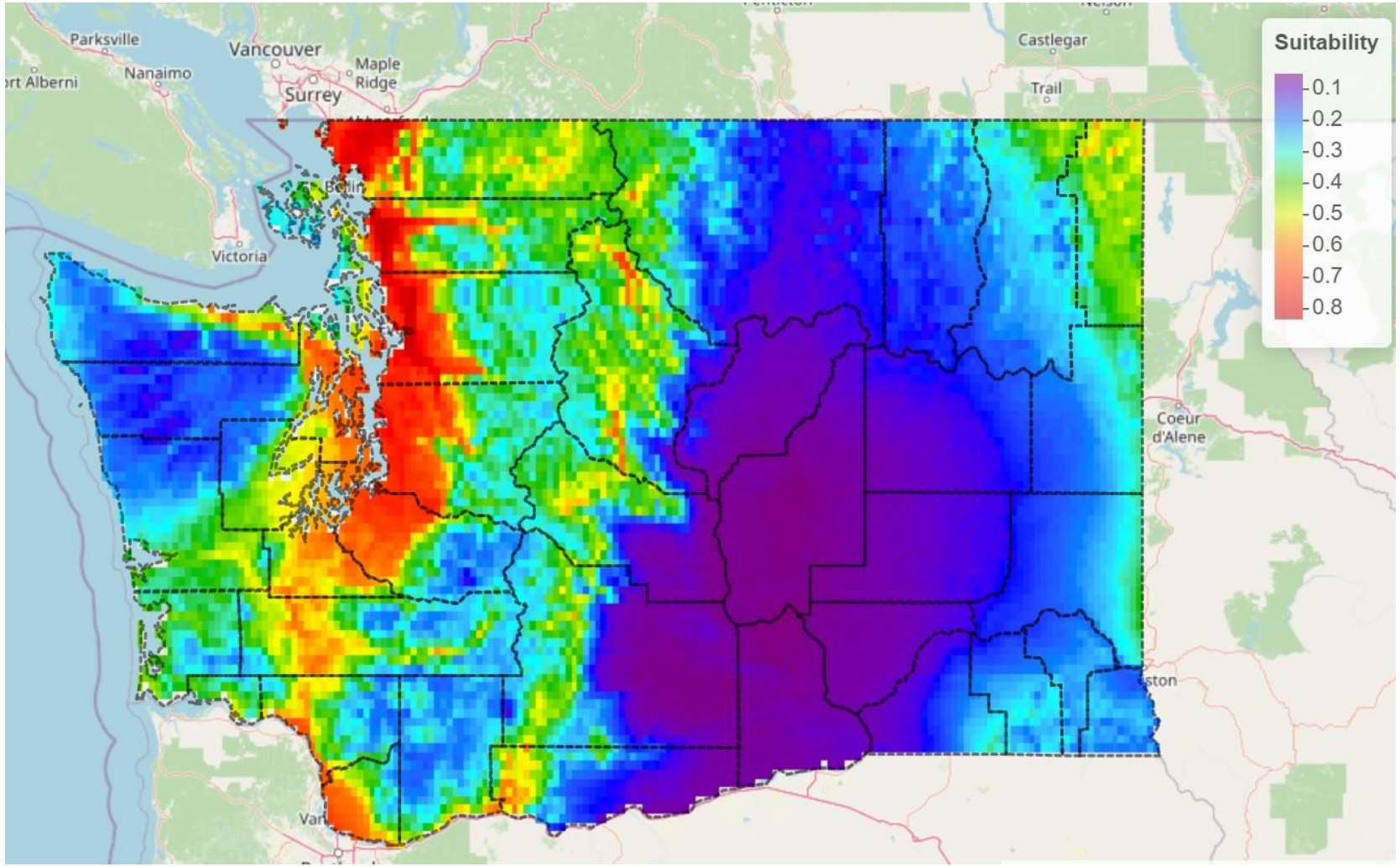
Pupation occurs in moist soil near the hive.

Lyle J. Buss, University of Florida.

Adults are responsible for dispersal and reproduction.

James D. Ellis, University of Florida, Bugwood.org

Small hive beetles do best in warm and humid conditions



Courtesy of Gengping Zhu

Small hive beetles can overwinter within the cluster.

Courtesy of Jon Zawislak

Small hive beetles will eat nearly anything found within a hive.

James D. Ellis, University of Florida, Bugwood.org

Pierco

Heavy infestations leave combs unusable and covered in a slimy film.

James D. Ellis, University of Florida, Bugwood.org

Nick Annand, NSW DPI

Workers will corral beetles to keep them away from the brood.

While corralled, beetles will get food from workers.

Small hive beetles will also infest stored comb and pollen supplements.

Small hive beetles can also infest bumble bee colonies.

Amanda Liczner, WPC

Identification

Adult beetles are dark brown or black and 1/3 the size of a honey bee.

Left photo: Natasha Wright, Florida Dept. of Agriculture, Bugwood.org. Center photo: Lyle J. Buss, University of Florida. Right photo: Lyle J. Buss, University of Florida

Larvae are cream colored and up to ½” long.

Pest and Diseases Image Library, Bugwood.org.

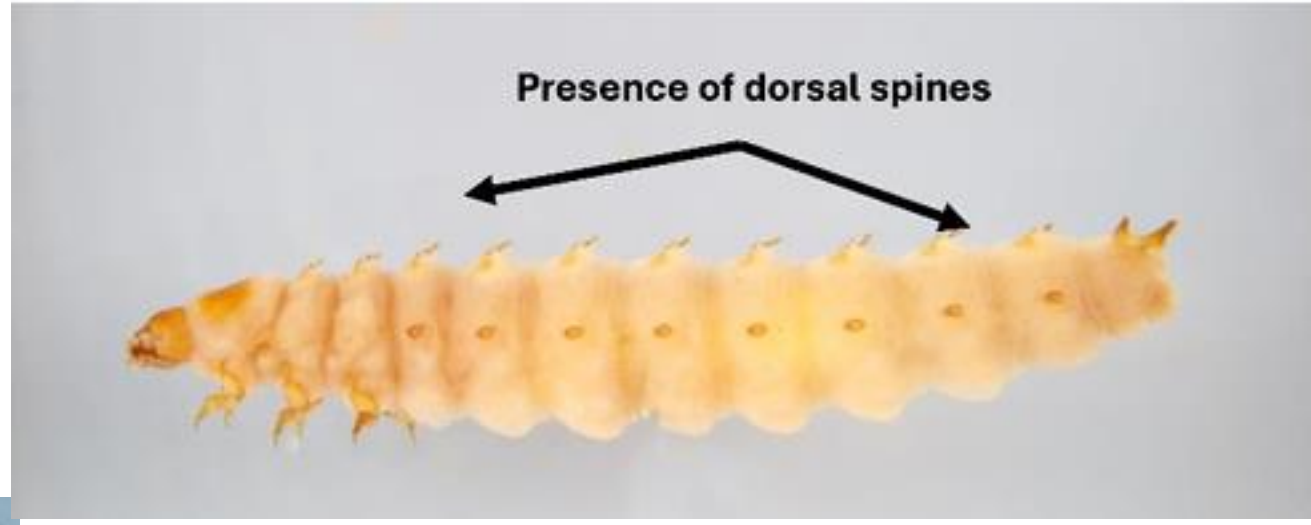
The four spotted sap beetle can also be found feeding on pollen patties.

Lyle J. Buss, University of Florida

Matt Shultz

Bumble flower beetles are several times larger than small hive beetles.

Unlike beetle larvae, wax moth larvae lack spines and have additional prolegs along their body.



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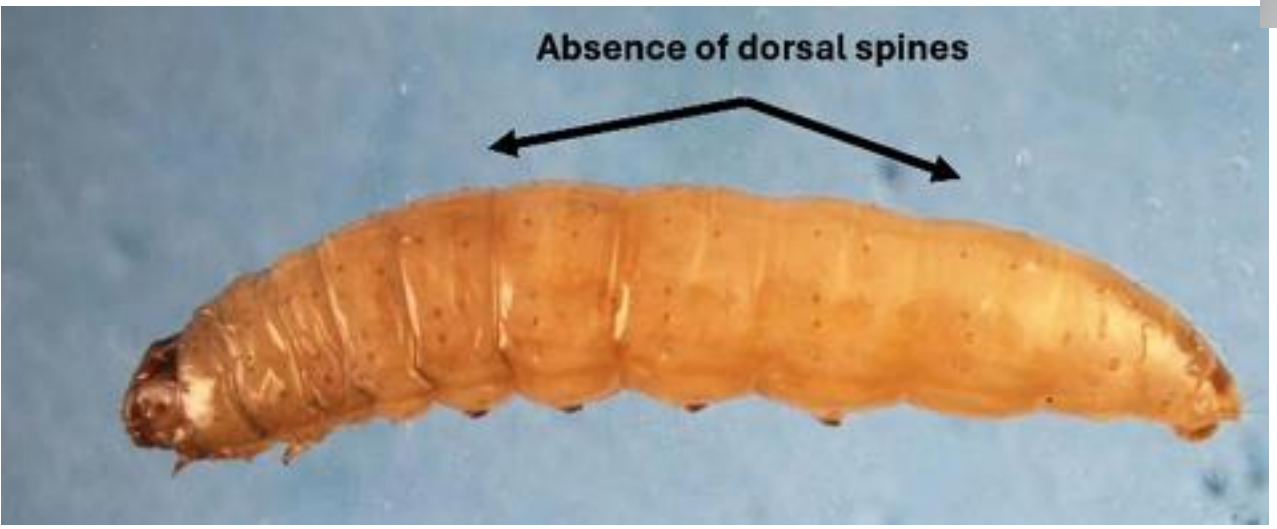


Susan Ellis, USDA APHIS PPQ, Bugwood.org

Wax moths create large amounts of silk rather than slime.

Nick Annand, NSW DPI

Flour beetles are significantly smaller and only eat detritus.

Lyle J. Buss, University of Florida

Gary Alpert, Harvard University, Bugwood.org

Large hive beetles are significantly larger than their smaller relative.

Ben Oldroyd, University of Sydney

Prevention

To prevent infestation, empty equipment should be stored properly

Only feed pollen patties that the colony can quickly consume.

Randy Oliver

Only add as many supers as the colony can defend.

Shinbone on Beesource.com

Trapping

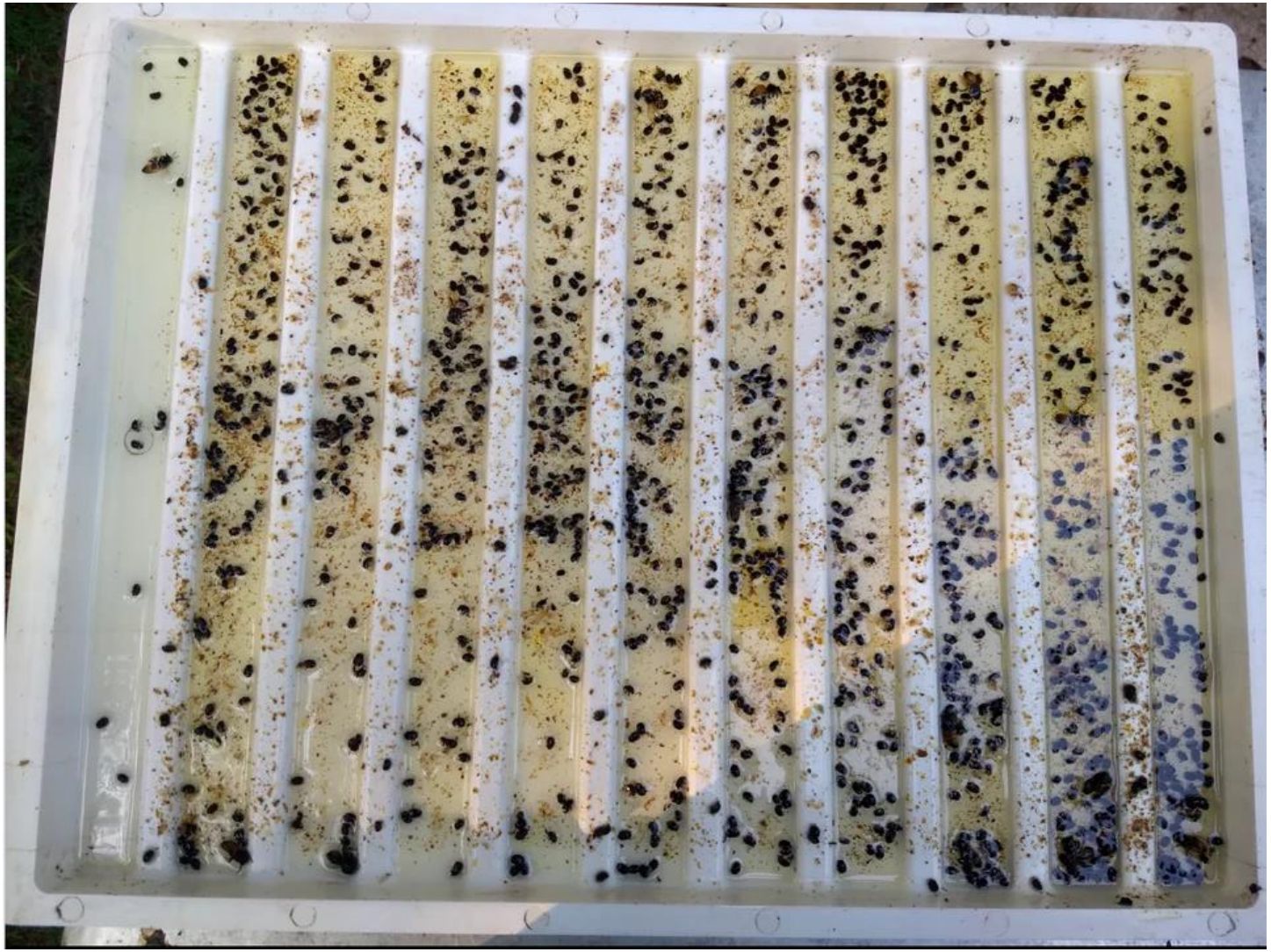
Oil filled traps are placed between outer frames.

Beekeepingmadesimple.com

Unscented Swiffer sheets can also be placed between boxes to trap beetles.

Beekeepingmadesimple.com

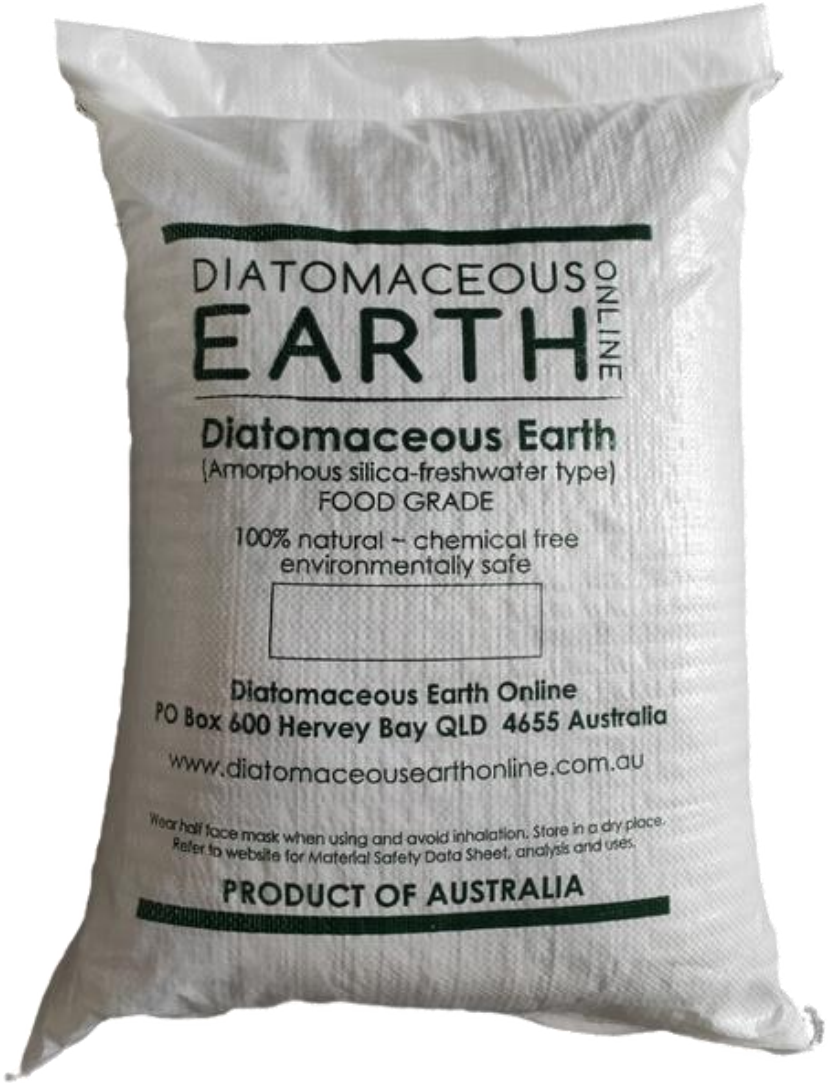
Oil filled trays can also be placed below a sceened bottom board.



Foxhoundbeecompany.com

Chemical Control

Diatomaceous earth can be carefully used outside of hives.



CheckMite+ can be used to fight large infestations.

Photo courtesy of Meyer Bees

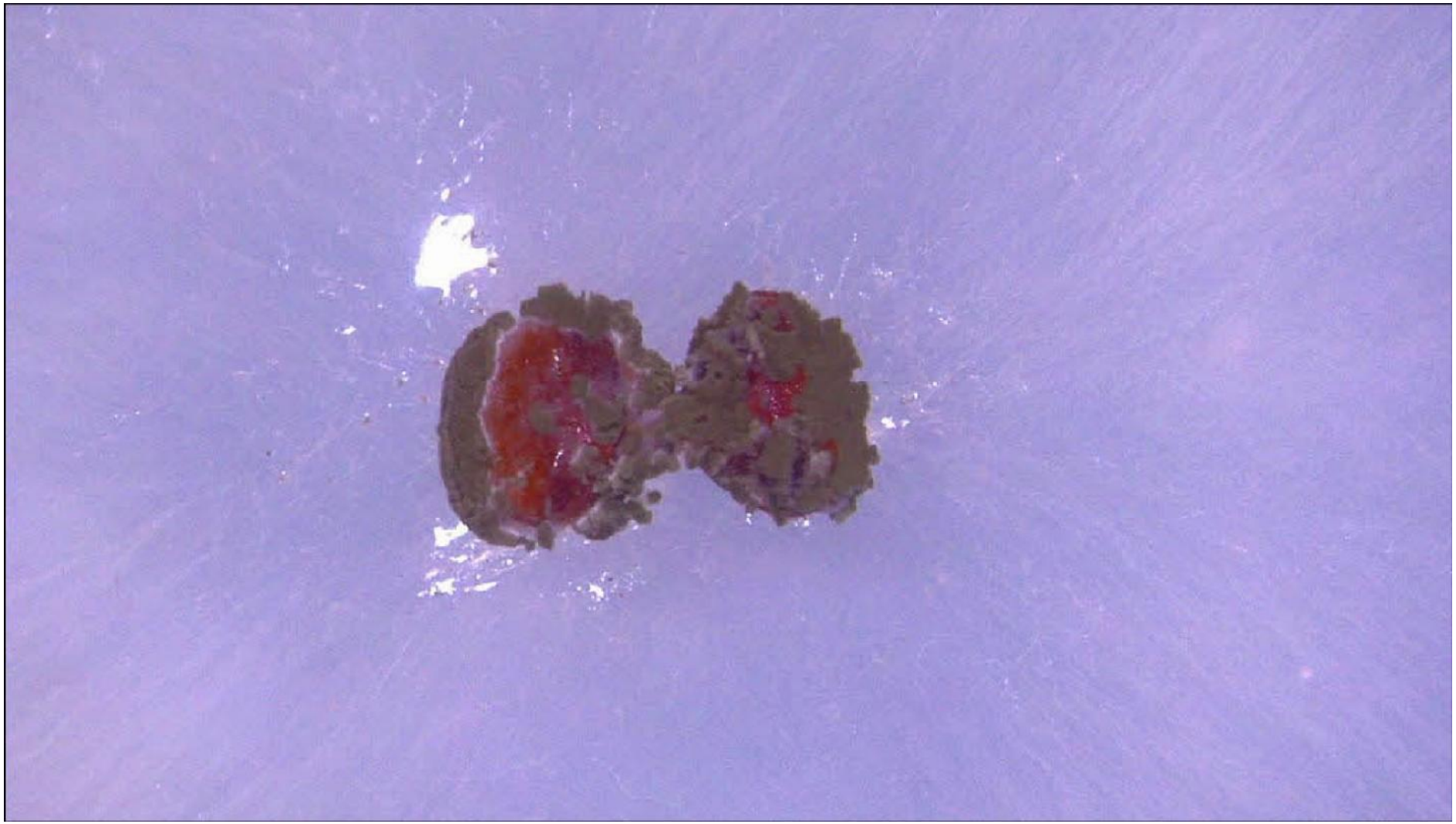
GardStar can be applied to soil around hives.

Photo courtesy of Y-Tex

Biological Control

Heterorhabditis indica or Steinernema sp.
Nematodes can be applied to soil around hives.

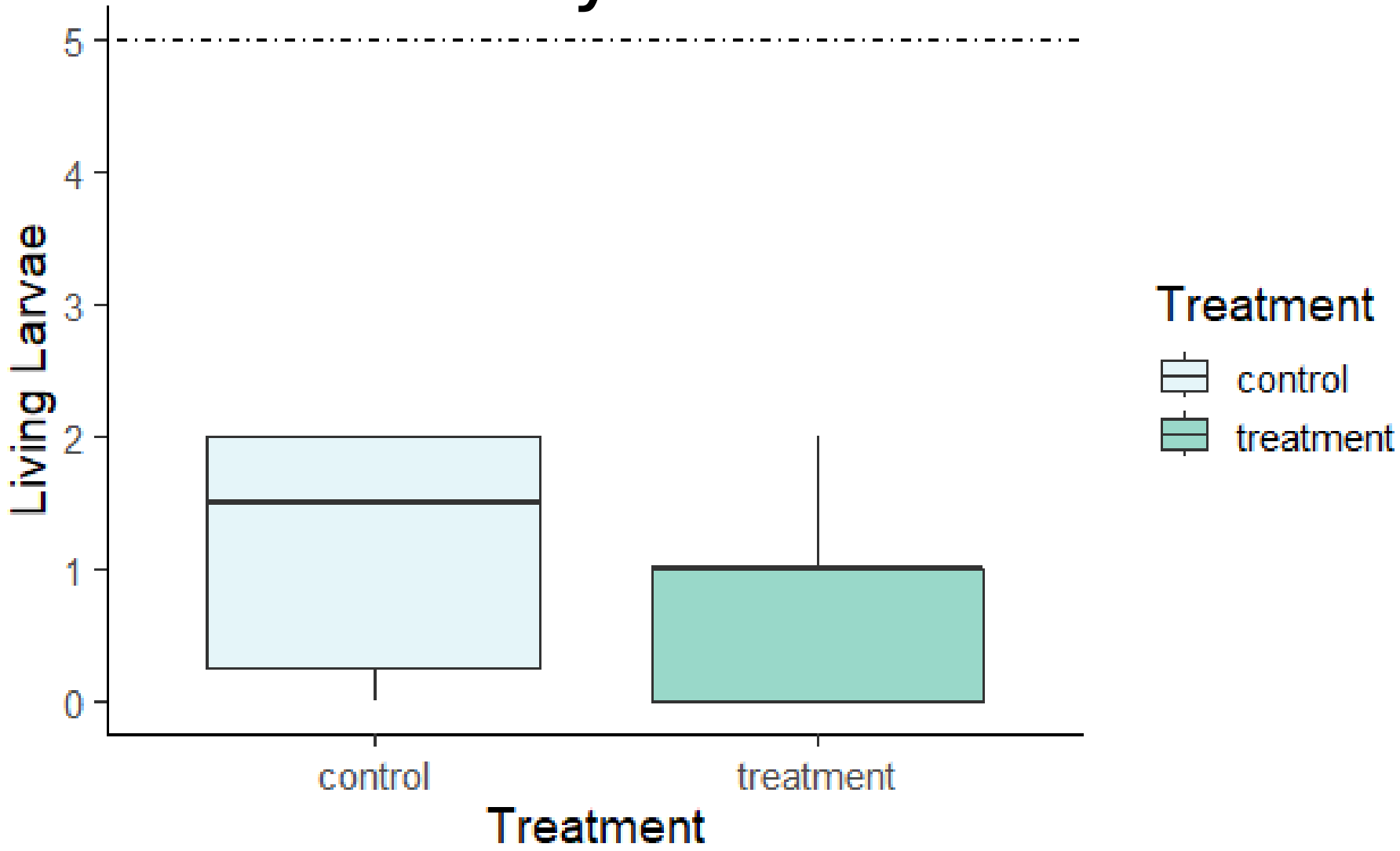
Fungi are being tested for control of small hive beetles.



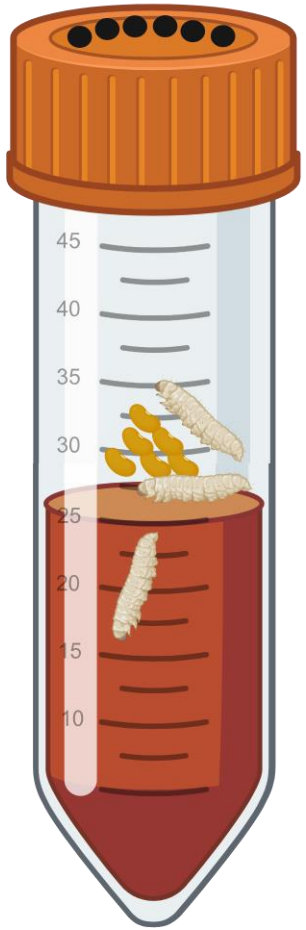
Young larvae were transferred to cages after being dipped in a spore solution.

Created in BioRender.com

Metarhizium treatment did not significantly increase larva mortality.



Despite this setback, we will continue this research.



Our new guide provides more information about small hive beetles.

A GUIDE TO THE SMALL HIVE BEETLE

AN EMERGING PEST IN WASHINGTON STATE

Introduction

The small hive beetle (SHB), *Aethina tumida*, is native to sub-Saharan Africa. SHB are members of the family Nitidulidae, nicknamed "sap beetles." This family of beetles is known to feed on decaying matter, pollen, fermenting plant juices, and decaying fruits. Small hive beetle is one in a handful of Nitidulids that live exclusively in honey bee hives but the only one to cause extensive damage (Ellis et al. 2008). Apart from the European Cape honey bee subspecies, *Apis mellifera capensis*, that is well adapted to small hive beetle infestation (Ellis et al. 2003), SHB has become a major pest to honey bee colonies and stored honey globally. These beetles were first detected in South Carolina in the 1990s (Schäfer et al. 2019) and quickly expanded their range within the US, being most prevalent in the southeastern states. The widespread range expansion of small hive beetles is likely facilitated by international trade of honey bee colonies and bee products.

Recently, reports from northwestern Washington indicate presence of small, sustained populations of SHB. This Extension publication will give Washington State beekeepers information to detect, accurately identify, monitor, treat, and report SHB infestation(s) in their region.

Potential Establishment in Washington State

Small hive beetles prefer climates with high humidity and temperatures for reproduction. Historically, SHB has been considered a transient pest, introduced from packages or bee products with little to no potential to sustain, in Washington State. It has long been assumed that climate and soil conditions would inhibit establishment of this species in Washington State. However, recent research has revealed that global warming may contribute to the expanse of suitable habitat for this invasive species. Under current and future climate scenarios, models of SHB survival and pupal development time, in response to soil conditions were created, then suitable regions were classified (Cornelissen et al. 2019); this work showed potential SHB invasion into more temperate regions.

Correlative ecological niche models were employed to make a heat map of SHB habitat suitability for Washington State, with red and orange being most suitable for reproductive populations and light blue and purple being least suitable (Figure 1). Highly suitable habitats were identified in low elevation areas of the Puget Sound and Cascade Mountain Range in western Washington. Northern areas near the Pacific Coast Range are not currently suitable areas for SHB. Northeastern Washington has relatively suitable climate, while most areas in eastern and central Washington that are characterized by arid high desert, rolling hills, and sagebrush, do not have suitable climate for SHB. The WSU Zhu Lab developed a habitat suitability map that allows users to zoom in on their region(s) to assess risk of sustained SHB populations (Figure 1).

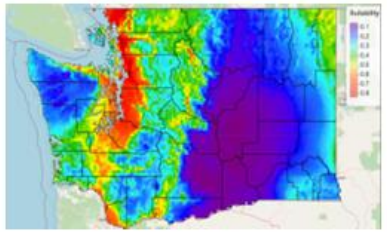


Figure 1. Heat map of habitat suitability based on ecological niche models. *Source:* The Zhu Lab, WSU.

Beyond the theoretical modeling that demonstrates potential invasion of small hive beetles in Washington State, recent reports and verified samples have been submitted to Washington

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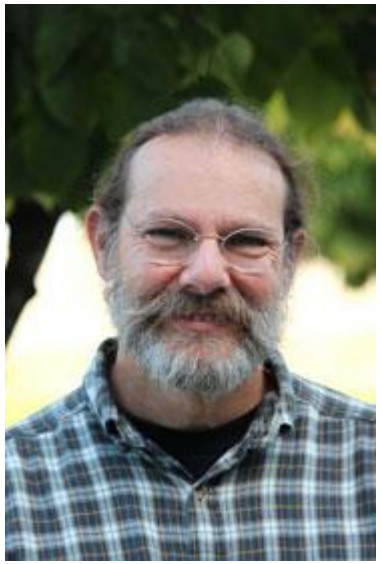

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