

The Small Hive Beetle: A Potential Pest in Honey Bee Colonies in Oregon

D. Caron, K. Torgerson, C. Breece, and R. Sagili

Introduction

The small hive beetle, *Aethina tumida*, an invasive and damaging pest of honey bee colonies, was accidentally introduced into the United States from southern Africa in the 1990s. The beetle has since been reported in 35 states, Canada, Australia, and Mexico. Small hive beetles (SHB) prefer hot, humid conditions, where the right combinations of rainfall and soil conditions are ideal for their reproduction. The small hive beetle is a menace in many states and is widespread in the southeastern region of the United States.

The goal of this publication is to familiarize Oregon beekeepers with this invasive beetle, as early detection, reporting, and monitoring of small hive beetle may help mitigate its establishment in this region. Although it has been occasionally observed in honey bee colonies in Oregon, no significant damage from this beetle has yet been reported. It is not clear whether this beetle can thrive in this state, given the soil and climatic conditions. Prior small hive beetle infestations in Oregon are believed to have occurred primarily via migratory bee colonies after almond pollination in California. The adult beetles have also been discovered in package bees and queens purchased from regions in the U.S. where small hive beetle is well established, such as Southern California, Georgia, Florida, and Texas.

We thank Jon Zawislak, of the University of Arkansas, for the SHB information described in the eXtension publication titled [Managing Small Hive Beetles](#), which has been partly used for developing this publication.



Adult small hive beetle.

Chris Hedstrom, Oregon Department of Agriculture

Description of the beetle

Adults

Adult SHB (Figure 1, page 2) appearance can vary even within a single population. In general, the adults are brown to black in color, oval shaped, and about 5.7 mm (approximately $\frac{1}{4}$ inch) long or about one-third the size of a honey bee. Often beekeepers are confused regarding SHB identification as there are several other beetles of similar shape, color, and size that are often found in or around the honey bee colonies, such as sap beetles (family: Nitidulidae) and rove beetles (family: Staphylinidae). Figures 1, 2,

Dewey Caron, professor emeritus, University of Delaware; Karessa Torgerson, bioscience research technician; Carolyn Breece, faculty research assistant; and Ramesh Sagili, assistant professor and Extension apiculturist; all of Oregon State University.



Hive
Beetle



Sap
Beetle

SPECIAL 3-D IMAGE: Images are 3-D renderings of the adult small hive beetle and the sap beetle. After downloading and opening the PDF, click and hold to rotate the image in any direction.

Rendering: Alan Dennis, Oregon State University



Figure 1. Dorsal, lateral, and ventral view of the small hive beetle.



Figure 2. Dorsal, lateral, and ventral view of the sap beetle *Brachypeplus basalis* (family: Nitidulidae)

Photos: Chris Hedstrom, Oregon Department of Agriculture



Figure 3. Rove beetle
(Photo: Joseph Berger, Bugwood.org)

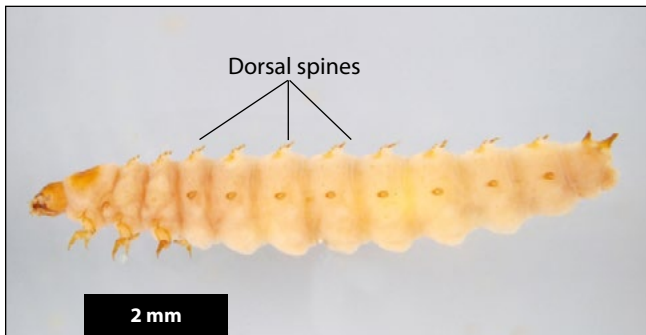


Figure 4. Small hive beetle larva
(Photo: Pest and Diseases Image Library, Bugwood.org)

and 3 will help differentiate some of these common beetles found in or around honey bee colonies from small hive beetles.

Larvae

The small hive beetle larvae are off-white in color and grow to a length of about ½ inch (approximately 10 to 12 mm). They are similar in appearance to the greater wax moth larvae (*Galleria mellonella*) and hence may be confused with them. Both have three pairs of well-developed legs on segments behind the head, but the SHB larvae can be distinguished by the absence of modified appendages, called prolegs, past the third segment (Figure 4). However, greater wax moth larvae (Figure 5) have prolegs on the third through the sixth body segments. SHB larvae have numerous dorsal spines, which wax moth larvae lack. SHB larvae produce slime, whereas wax moths have silken protective webbing.

Life cycle

Female SHB lay eggs in clutches in cracks or crevices inside bee hives or in cells with brood or beebread. The eggs are about two-thirds the size of a



Figure 5. Wax moth larva
(Photo: Susan Ellis, U.S. Department of Agriculture Animal and Plant Health Inspection Service, Bugwood.org)

honey bee egg and similar in appearance. They hatch in 2 to 4 days. Beetles complete their larval development in as little as 5 days, generally within 2 weeks, during which time they feed on honey, pollen, and brood. The mature larvae gather on the bottom board or at lower margins of the hive and wait for favorable environmental conditions before exiting the hive en masse to pupate in the soil. The larvae can crawl several feet if necessary, but they usually burrow into soil within approximately 2 feet (0.6 m) of the exited hive.

Once the beetle larvae find suitable soil, they burrow approximately 4 inches (10 cm) deep and pupate in the soil. The pupae require about 3 to 6 weeks to mature, depending on the environmental conditions. Small hive beetles prefer high temperatures and humid climatic conditions to thrive. The soil and climatic conditions in Oregon may not be ideal for continuous reproduction and development of SHB.

Within 1 to 2 days of emerging from the soil, adult SHB can fly a substantial distance. They locate a honey bee colony by detecting hive-specific odors. Females can produce eggs within the first week upon entering a honey bee colony. Overwintering bee clusters may harbor beetles within their preferred temperature range, although there may be little SHB reproduction from late fall to early spring, even in southern U.S. locations where conditions are ideal. Figure 6 on page 4 depicts the life cycle of SHB.

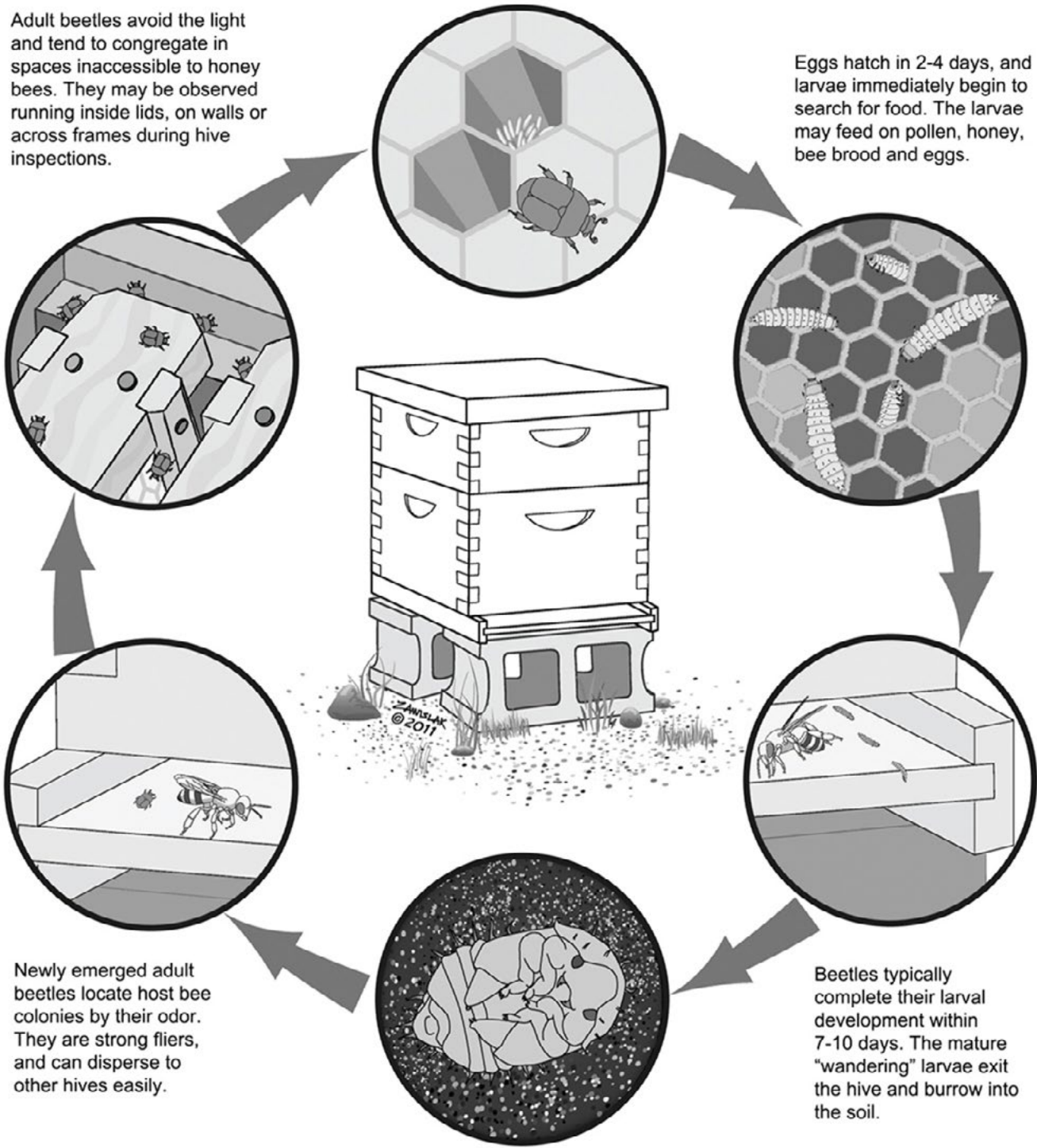
Continued on page 5

Figure 6.

Female beetles deposit masses of eggs in crevices around the hive or directly on pollen or brood combs. Beetles may puncture the wall or capping of a sealed cell and deposit eggs inside.

Adult beetles avoid the light and tend to congregate in spaces inaccessible to honey bees. They may be observed running inside lids, on walls or across frames during hive inspections.

Eggs hatch in 2-4 days, and larvae immediately begin to search for food. The larvae may feed on pollen, honey, bee brood and eggs.



Newly emerged adult beetles locate host bee colonies by their odor. They are strong fliers, and can disperse to other hives easily.

Beetles typically complete their larval development within 7-10 days. The mature "wandering" larvae exit the hive and burrow into the soil.

Beetle larvae pupate in the top 4" of soil, on average. Pupation takes 3-6 weeks to complete, depending on temperature and soil moisture.

Illustration: Jon Zawislak, University of Arkansas



Figure 7. Small hive beetle damage
(Photo: James D. Ellis, University of Florida, Bugwood.org)



Figure 8. Wax moth larvae on a frame
(Photo: Ramesh Sagili, Oregon State University)

SHB in honey bee colonies

Adult SHB beetles have tough, sting-resistant elytra (modified hard front wings), which make it difficult for honey bees to mount an effective defense. The compact body of the beetles and their ability to seek shelter in hive cracks and crevices make it nearly impossible for the adult bees to evict them from the hive. Honey bees attempt to manage beetle populations in the colonies by creating confinement areas using propolis, not allowing beetles to move out of their hiding locations (cracks and crevices in the hive) to feed. Interestingly, it has also been documented that some beetles are able to trick bees into feeding them by begging.

In small colonies such as divides or splits, newly hived packages, nucleus hives (nucs), or post-swarm colonies, the SHB population can grow rapidly, beyond the colony's ability to keep it in check. Divides or splits are hives that were established by transferring frames of bees, brood, and food stores from a big or strong parent hive. A nuc or nucleus hive is a small hive consisting of five or six frames. Other factors that appear to exacerbate infestation include too-frequent hive inspections by beekeepers, declines in colony health, and a queen event (loss of queen or supersedure). In colonies having excessive space (multiple empty honey supers) or colonies that have recently swarmed, beetles can lay eggs away from the active bee population and thrive.



Figure 9. Wax moth larvae damage
(Photo: Ramesh Sagili, Oregon State University)

Additionally, SHB populations may quickly build up when beekeepers add protein supplement (patties) to a colony. Adult beetles are attracted to protein patties, and beetle larvae growth and development are particularly enhanced by feeding on these patties. In fact, protein patties can be used as an early warning to monitor for SHB infestation, but if beetles and their larvae are found on protein patties, then the patties must be promptly removed to minimize successful completion of SHB life cycle. Commercial beekeepers in Oregon may consider not using or removing protein patties from colonies pollinating almonds in California to reduce the attraction of beetles from neighboring colonies.



Figure 10. Hive body placed into the outer cover
(Photo: Jared Jorgensen, Oregon State University)

Damage caused by small hive beetle

Colony damage becomes readily apparent when the SHB infestation exceeds the level that can be effectively managed by the honey bee population. Indications of a severe infestation include slimy and discolored honey comb, masses of small hive beetle larvae (Figure 7, page 5), and adults feeding on honey bee larvae, eggs, and food stores (pollen and honey). During severe beetle infestation, honey bee queens may stop laying eggs and the colony may abscond. Wax moth larvae damage can be differentiated from small hive beetle larvae damage by the presence of webbing (Figures 8 and 9, page 5).

The SHB larvae can cause significant damage to stored comb and honey supers that have been removed from the colony, but not extracted right away, as well as unwashed cappings from extracted honey. Honey that has been contaminated by SHB excrement is not fit for human consumption.

Detection of small hive beetle

Upon initial infestation of a honey bee colony, SHB may escape the attention of the beekeeper until the population becomes established through new, incoming beetles (immigration) or reproduction. Beekeepers should keep the possibility of SHB in mind, especially during summer and fall colony brood inspections and when feeding protein supplement in the fall. Honey bee hives purchased from southern or southeastern U.S. or California should be inspected for presence of SHB.

When a hive is opened for inspection, the beetles quickly flee and hide in hive crevices. The adult



Figure 11. Lifting hive body to inspect beetles that may have moved down onto the outer cover

(Photo: Jared Jorgensen, Oregon State University)

beetles readily run away from light and might only be seen very briefly on the inner cover or on top bars, or running across the combs. Because they avoid light, the easiest way to check for the presence of adult beetles during a hive inspection is as follows: Place the outer cover on the ground in a location under direct sun light. Remove the top hive body and place into the outer cover (Figure 10). Make sure that the hive body placed on the outer cover is adequately exposed to sunlight. When the colony inspection is complete, quickly lift the top hive body that was placed on the outer cover and look for beetles that might be hiding in the relative darkness inside the cover (Figure 11).

Beekeepers can also create an adult beetle detection trap by placing strips of corrugated cardboard or plastic material (or any material with small cavities between two solid layers) on the bottom board near the back of the hive or on the top bars. Beetles sheltering in the corrugations will be readily visible upon examination of the material. The sticky boards intended for varroa mite monitoring are not an effective means of beetle detection. If you suspect presence of SHB in your colony, collect adult beetles or larvae or both and preserve them in alcohol. Bring the samples to your local Extension office or the Oregon State University Honey Bee Lab for positive identification. Identification may also be possible by sending clear photos of beetle adults or larvae or both.

Prevention and control

A beekeeper's best defense against SHB is maintaining strong colonies and clean apiaries free of abandoned hive materials (especially wax combs) or dead-outs and implementing timely control measures when beetles are detected in the colonies. Unfortunately, there is no economic threshold (number of beetles in a hive to take action) established for SHB, as their reproduction and damage to colonies depend on several factors, such as colony strength and prevalence of other pests and pathogens.

Beekeepers are advised to practice good bee stewardship and reduce stresses from diseases, mite parasitism, queen events, and other factors. Consider bee stocks with hygienic traits and place colonies in sunny locations. Take quick, corrective measures, such as requeening, strengthening colonies, removing weak colonies, or combining weak colonies, before small hive beetles become a problem. Take proper care when equalizing or combining colonies to avoid introduction of beetles into uninfested colonies in areas where small hive beetles have been detected or reported. Avoid making splits from heavily infested hives; the reduced bee populations in the splits may not be able to keep the beetle populations in check.

Honey house or honey extraction facility management

Sanitation of the honey house is very important if SHB is present in your location. Wax comb (especially with honey and pollen stores) left around the apiary may attract small hive beetles and provide habitat for their successful reproduction. Freeze all the frames infested with beetle larvae or eggs for at least 48 hours. Also, freeze all honey frames from the infested colonies before storing.

In the honey house, larvae leaving honey supers in search of soil to pupate could be attracted using a single fluorescent light placed near the floor. Once the beetle larvae crawl to the floor surface near the light, they can be collected and killed with soapy water.

SHB reproduce well in moist and loose or sandy soil. Beetle reproduction may be impeded by either placing colonies on rocky or clay ground or on man-made platforms that prevent the larvae from accessing soil for pupation.

Chemical control options are available in case of severe beetle infestation, but they should not be used prophylactically. Coumaphos (CheckMite+) is the only registered insecticide that is available for controlling small hive beetles in honey bee colonies. Unfortunately, resistance has been reported for this product in small hive beetles. In case of severe infestations where numerous larvae are observed in infested colonies, drench the soil with the insecticide permethrin (GardStar®) to prevent the larvae from pupating successfully.

Mechanical beetle traps have been reported to be effective in controlling SHB. There are a few different types of mechanical traps available in the market. Contact beekeeping supply stores for these beetle traps. For further information on mechanical beetle traps, refer to the eXtension publication [Managing Small Hive Beetles](#).

SHB in Oregon

Current climatic conditions may not be ideal for SHB overwintering, pupation, or establishment in most of Oregon, but future changes in climate, such as frequent mild winters, could aid in their establishment. Early detection and control of SHB will help keep or delay this pest from successfully establishing in Oregon.

Use caution when purchasing package bees, established colonies, or queens from locations where SHB is well established. Also, monitor your colonies for small hive beetles during summer and fall if you regularly transport your bees across state lines for pollination, especially to California for almond pollination.

For additional information

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To report a sighting

If you find evidence of small hive beetle, please report to:

Oregon State University Honey Bee Lab
4017 ALS Building, Corvallis, OR 97331
Phone: 541-737-1447
honeybeelab.oregonstate.edu

Use pesticides safely!

- Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.
- Read the pesticide label—even if you've used the pesticide before. Follow closely the instructions on the label (and any other directions you have).
- Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

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