



# Small Hive Beetle - A Beekeeping Pest

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## Introduction

Small hive beetle (SHB) was first detected in apiaries in north-west Victoria and the Goulburn Valley in 2005. In August 2007, they were again detected in north-west Victoria. At the time of writing, SHB had not been reported in any other district.

SHB is a native of Africa where it occurs in tropical, sub-tropical and warm temperate zones, mostly affecting weak honey bee colonies.

In 1998, SHB was found in Florida, USA, where it is considered to be a destructive pest of honey bees and beeswax combs. Beetle numbers are highest in the warm and humid coastal areas of the USA.

In October 2002, SHB was detected in New South Wales and Queensland, the first occurrence in Australia. By 2006, SHB was present in hives in a number of districts in NSW but no significant SHB damage had been reported in areas away from the coast.

The full effect of SHB on Victorian beekeeping will only be known when the beetles spread and their numbers increase. Beekeepers will need to change some beekeeping practices (as described later) to minimize the effect of SHB.

## Damage caused by SHB

- larvae burrow and tunnel through comb, piercing and damaging the wax comb and cell caps
- larvae eat honey, pollen and live honey bee brood (eggs, larvae and pupae)
- larvae defecate in the honey causing it to ferment, froth and weep from the cells. The fermenting honey has an odor of decaying oranges. A combination of fermenting honey, SHB secretions and excrement results in a slime on the combs and other components in the hive. Contaminated honey is unsuitable for sale and unacceptable to bees as bee food
- honey bee queens may stop egg laying and the number of adult bees in the hive may quickly fall
- the honey bee colony may abscond when SHB infestations are heavy and slime is present

- combs of honey removed from hives and put aside for extracting at a later time may be ruined
- stored combs, beeswax cappings, section comb honey and bee collected pollen are prone to infestation. Newly drawn combs appear to be more easily damaged than older brood combs that have been toughened by several layers of honey bee pupal skins
- weak and queenless colonies appear to be most at risk. In Florida, reports indicate that even strong colonies may be at risk when SHB numbers are high.

## Description and characteristics of life cycle stages

SHB may have up to five generations during the warm months of the year. Breeding usually ceases during cold winter months. SHB populations are likely to be highest in areas that have loose sandy or sandy-loam soil (*see 'Pupae' below*) compared to areas with hard clay soils.

### Eggs

- laid in irregular clusters in crevices and cavities in the hive and near, or on combs. Eggs may be found next to, or in cells that contain pollen
- about half the size of honey bee eggs (1.4 mm long and 0.26 mm wide). The clusters of eggs are not easily seen and it is better to search for larvae or adults when looking for SHB. If you wear glasses for reading, you will certainly need them to see SHB eggs
- most eggs hatch within 2-4 days, but some hatching may occur anytime from 1 to 6 days.

### Larvae

- 11.1 mm long and 1.6 mm wide when fully grown
- cream to white
- spines on the upper part of the body and two spines protruding from the rear of the larva
- 6 legs only, all at the front of the body
- most larvae mature within 10-16 days, but this period may be as long as 24 days.



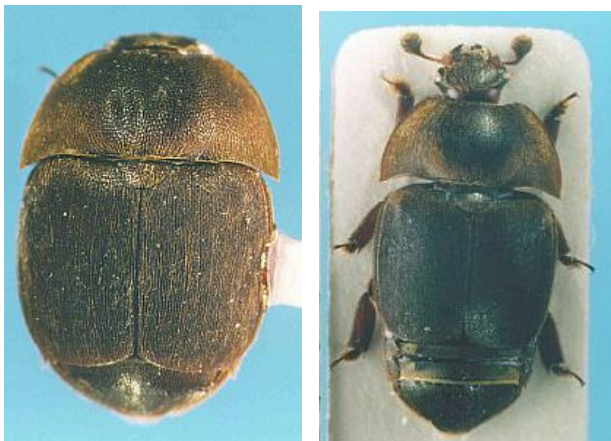
*Photo 1. SHB larva (not actual size). Photo courtesy of Division of Plant Industry, Florida Department of Agriculture and Consumer Services.*

### **Pupae**

- mature larvae move from the hive to pupate in the soil up to a depth of 200 mm (usually around 100 mm) and generally within 900 mm of the hive (mostly at 300 mm from the hive). Some may pupate under the hive
- pupae are white at first, but turn brown as they mature
- adult SHB emerge from the soil generally within a period of 15-60 days depending on soil temperature, but at 10°C this period may extend to 100 days.

### **Adults**

- broad and flattened with clubbed antennae, 5-7 mm long and 3-4.5 mm wide
- yellowish brown at first, sometimes turning reddish brown, then light brown to black
- when the hive is opened they quickly run to hide in dark places, though some may 'play dead'
- may live up to 50 days when feeding on old empty brood comb and approximately 6 months when feeding on honey



*Photos 2 and 3 (not actual size).*

*Left - Natural view of beetle as found in hive. Right - Extended view of preserved beetle specimen. Photos courtesy of Division of Plant Industry, Florida Department of Agriculture and Consumer Services.*

- may survive for up to 14 days without food or water
- adults can overwinter in the winter honey bee cluster in hives
- adults prefer weak hives in spring and summer, but strong hives in autumn where they can keep warm.

## **Inspecting hives for adult beetles and SHB larvae**

People inexperienced in handling bees should first read the Agriculture Note AG1240 'Safe beekeeping practices'. It is essential that adequate protective clothing, including a bee veil, is worn and techniques for safe handling of bees are understood before opening hives.

Adult SHB are able to move extremely quickly and can disappear out of sight within seconds.

- remove the hive lid and check the under side of the lid for beetles
- lift the hive mat (if present) and watch for quickly escaping beetles that will run down the face of the combs and try to hide in cells
- remove the super and place it on an upturned hive lid. Wait 1-2 minutes and then remove the super and look for beetles in the lid where they will have moved from the combs to try to hide from the light
- lift the bottom box and look for beetles on the bottom board, especially any rubbish and the back corners where it is dark
- if the bottom box is fixed to the bottom board, remove all the combs from the box and then check the bottom board for beetles. Quickly check each comb for beetles and larvae as it is removed from the box
- inspect all honey and brood combs for beetles and larvae. Larvae, when present, may be found on any comb throughout the hive. However, larvae develop under cell caps and may not be seen until the caps are removed
- examine pollen cakes for larvae and in-hive open sugar syrup feeders for beetles.

## **Spread of SHB**

Beetles may fly distances of up to 7 km. They can follow the migration of swarms.

SHB may be spread by the movement of hives, nucleus hives, package bees, queen banks, all types of combs, used hive components, bee collected pollen, comb honey, slum gum and beeswax cappings and scraps yet to be melted down. Beetles can also be transferred on protective clothing and bee veils.

Adults may be present for extended periods in hives that show no signs of damage by SHB larvae.

SHB is not spread by queen bees and escorts that are hand caught and placed in new queen cages for sale to beekeepers.

## **Management of honey bee colonies to control and minimize the impact of SHB**

The aim of the practices below is to reduce the number of beetles around the apiary and honey extracting plant to help reduce the level of infestation in hives.

There are no chemicals approved for use in beehives for the control of SHB.

**Maintain strong colonies**

Beetles will mostly choose weak colonies in which to breed. It is best to unite weak colonies to form stronger ones. Alternatively, weak colonies may be strengthened by adding one or two combs of sealed brood taken from strong healthy colonies.

Make sure the colonies are free of American foulbrood disease before uniting them. Don't place SHB infested combs and material onto colonies free of SHB because the infestation will soon spread throughout the entire hive.

**Minimise opening the hive**

The combined odors of honey, pollen and adult bees attract adult SHB to apiaries. Beetles are more attracted to hives that have been opened especially when bees are squashed. Opening a hive and manipulating the combs also appears to trigger female SHB adults already present in the hive to lay eggs, which results in a rapid increase of SHB larvae.

While it is recommended that the opening of hives be kept to a minimum, it is still necessary to inspect brood during the season for signs of American foulbrood and to conduct normal hive management.

**Comb space**

Combs not covered by bees are especially prone to SHB damage. Supers of combs should only be added to hives when they are required. As a guide, only add a super when at least 70% of combs in the hive are filled with honey and/or brood. Excess combs are best removed from the hive and then protected and stored as described below.

**Avoid leaving honeycombs above clearer boards**

Combs of honey left above clearer boards are unprotected by bees and heat generated by the colony can provide a favourable environment for fast development of SHB larvae. The honey combs should be removed from the hive for extracting as soon as the bees clear the supers.

**Maintain good apiary hygiene**

Discarded comb, burr comb and beeswax scraps left around the apiary will attract beetles and encourage them to breed. These items should be collected and processed removed for processing. Dead hives should first be inspected for presence of American foulbrood (AFB), and if found free of AFB they should be removed from the apiary and stored as described below. Notify one of the Department of Primary apiary officers listed below if there is a suspicion of AFB.

**Avoid using untreated infested hive material**

Infested hive components and combs, should not be placed on hives with bees until they have been treated to kill all SHB life-cycle stages. Combs not damaged by larvae, but taken from infested hives may contain eggs. These are best cold treated (as described later) before reuse.

Bees are unlikely to accept combs with slime and/or contaminated honey.

**Keep hives in the sun**

SHB prefer hives located in shade.

**Management to control SHB around the honey extracting shed****Extract combs of honey immediately after removal from the hive**

Combs of honey may appear free of infestation but could have SHB eggs or very small larvae at the time of removal from the hive for extracting. SHB eggs hatch within 2-4 days and contamination of the honey combs will soon occur as larvae develop. The risk is greater if pollen and/or honey bee brood is present in the combs.

Beetles may also lay eggs on combs set aside for extracting and the hatching larvae can quickly ruin the honey and combs.

The hatching of SHB eggs is inhibited when relative humidity is below 50%. The circulation of dry air between combs of honey waiting to be extracted can provide complete or almost complete protection from SHB damage.

**Protect beeswax cappings and bee-collected pollen**

Cappings should be melted and processed into beeswax cakes without delay to avoid infestation and damage by SHB. Pollen is also at high risk and can be protected by packaging into sealed containers and freezing as described below.

**Clean-up around the honey shed**

Discarded and unprocessed comb, beeswax scraps and slum gum left around the honey extracting plant will attract adult beetles and provide an opportunity for them to breed. These items should be melted and processed without delay.

**Protection of combs, equipment and apiary products using cold temperature**

Extracted combs (*stickies*) and other drawn combs are prone to SHB infestation, particularly if they contain pollen and brood. Steps should be taken to protect them.

Research conducted by the NSW Department of Primary Industries (Levot *et al*, 2005) found that all SHB life-cycle stages were susceptible to cold temperature. The minimum exposure times needed to disinfest boxes of empty stored comb were 6 hours in a freezer (temperature of minus 13°C to minus 22°C) or 12 days in a refrigerated cold room (temperature of 1°C to 9°C). If combs of honey and/or pollen are to be cold treated, allow additional time for the combs to reach the required cold temperature before commencing the actual treatment period.

**Storage after cold treatment**

After cold treatment, items to be stored should be immediately placed in a sealed container, strong plastic bag or other SHB proof environment to avoid becoming infested again. Storage in cold rooms, as for wax moth prevention, is used in other countries.

## Trapping to reduce SHB numbers

Studies in NSW (Levot *et al*, 2005) found that squat plastic containers having a hinged lid and several compartments (as used by anglers to hold fishing hooks) made useful traps when placed in the hive on the bottom board underneath the frames. Holes, 4.5 mm diameter, were placed in the lid to allow entry by beetles but not bees. The holes were made using a drill or hot tip of a soldering iron according to the type of plastic. The compartments were partly filled with vegetable oil in which the beetles drowned. The partitions were helpful in retaining the oil where the hive was situated on an slope.

It appears that this type of trap is more effective if the trap covers the entire bottom board of the hive. This would need a tray for the oil and a cover with suitable holes for the beetles to pass through. Some adjustment to the height of the bottom board riser may be necessary for the trap to be positioned under the frames of the bottom box. The hive should be level so that the oil is retained in the trap. Bees contacting the oil are likely to die.

If SHB larvae are a problem in extracting plants, the use of fluorescent light sources at night, placed on or near the floor, will attract those larvae looking for soil in which to pupate. The larvae accumulate at the light and can be easily swept up and destroyed in soapy water.

## SHB and wax moth larvae

Both SHB and greater wax moth larvae may be found in the one hive. Both species have 6 legs near the head, but wax moth larvae also have small, less developed, prolegs in pairs along the body. Unlike wax moth, SHB larvae have 2 rows of short spines on their backs, two of which protrude at the rear of the larva. SHB don't produce silk webbing when feeding as wax moth do. Wax moth larvae grow to 25mm in length, whereas SHB larvae are about half that length.

## Requirement to notify presence of SHB

Beekeepers are asked to advise their nearest apiary officer when they find SHB in their hives. Beekeepers' details will remain confidential in line with current privacy laws. The information will only be used by the Department of Primary Industries to gain knowledge of the spread and impact of this new pest. Notification of the presence of small hive beetle is required by the Livestock Disease Control Act 1994.

## Further information

If you have questions about SHB please contact one of the following DPI apiary officers:

Bill Shay, Bendigo, Telephone 5430 4495

Joe Riordan Wangaratta, Telephone 5723 8600

Ray Gribbin, Bairnsdale, Telephone 5152 0600

Russell Goodman, Knoxfield, Telephone 9210 9222

## References

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*The previous version of this Information Note was published in September 2007.*

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