Department of Primary Industries
and Regional Development

Primefact

Small hive beetle management options

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Nicholas Annand and Doug Purdie

Control strategies for NSW beekeepers

Summary

Small hive beetle (SHB), *Aethina tumida* Murray, Order Coleoptera (beetles), is a member of the Family Nitidulidae which contains a number of similar beetles native to Australia. This scavenger of honey bee colonies, which originated from sub-Saharan Africa, was first identified in Australia in October, 2002. When identified, the SHB was well entrenched in feral and managed honey bee colonies, preventing any eradication attempt. The large number present and spread of the SHB indicated they had been in NSW for well over a year prior to identification. In their native homeland, SHB are considered a minor pest to the African species of honey bees. Where SHB incursions have occurred and European honey bees are managed in hot humid locations e.g. south-eastern USA 1998 and eastern Australia 2002, SHB have become a major pest of beekeeping industries.

Current distribution

SHB can be found throughout much of the eastern states particularly along the warmer coastal strip, where climatic conditions better suit the SHB life cycle which favours warm, humid weather.

Spread

Since its discovery, SHB has spread rapidly. Factors aiding its rapid spread have been:

- The migratory nature of commercial beekeeping in Australia. Beehives are often moved over large distances and inadvertently carry any SHB present to new locations.
- The strong flight capability of SHB. SHB quite readily take flight when temperatures are high and seek out new colonies. It is suggested that SHB are capable of flying over 10 km, and they can readily detect and intrude into honey bee colonies, aiding their establishment in new areas.

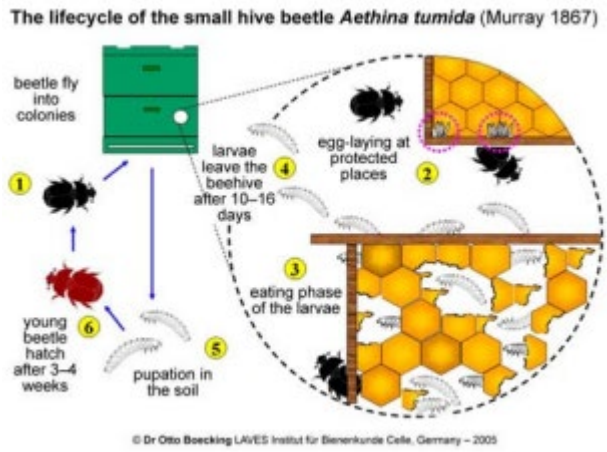
Large numbers of feral honey bee colonies have allowed SHB to become established in areas of suitable climatic conditions.

Life cycle

Temperature and available food will cause variation to the life cycle, with higher temperatures (to a threshold) resulting in faster development rates. Lack of protein in the diet slows the development of larvae and results in smaller adult SHB. Egg laying by female SHB also declines to zero relative to the protein in their diet.

Average development rates

SHB can reproduce on fruits in the laboratory with limited success; however, it is very unusual to see SHB on fruit in the environment. Honey bee colonies are their preferred food source.



Eggs	1–6 days	Usually 2–3 days
Larvae	10–28 days	Usually about 16 days
– feeding	6–14 days	
– wandering	4–3 days	
Pupae	10–60 days	Usually 21–28 days
Adults		
– sexual maturity	7 days	
– life	6 months	

Identification

Eggs

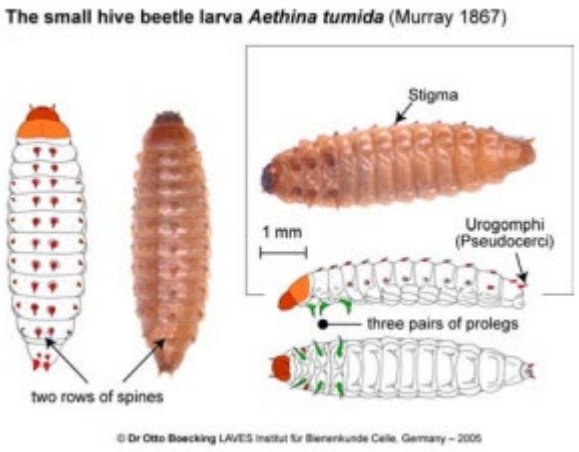
Pearly white colour, about 1.4 mm long and 0.26 mm wide, about two-thirds the size of a honey bee egg. Eggs are laid in irregular clusters, usually in cracks and crevices in honey bee colonies, close to a food source.

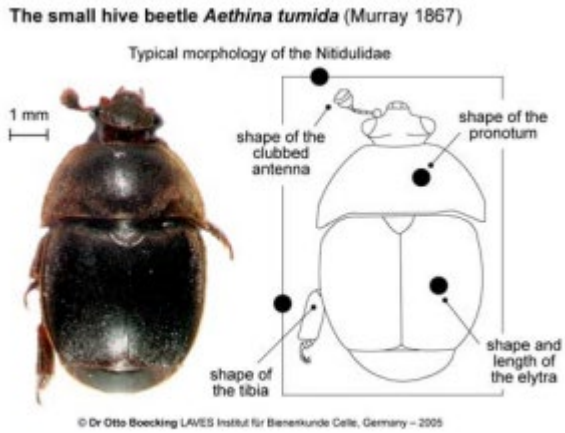
Larvae

Creamy white colour, growing to 10 mm long and 1.6 mm wide. They have six prolegs at the front of the body that provide good grip and two rows of small spines along their back. Unlike wax moth larvae, which produce webbing (the damage left is dry), SHB larvae chew through combs, causing the honey to ferment, resulting in ‘sliming’ of the combs. It is this stage of the life cycle that causes the most damage to honey bee colonies.

Pupae

Mature larvae leave the hive to pupate within close proximity to the hive. They usually burrow into moist soil to a depth of 5–20 cm but can utilise a range of moist mediums. SHB can crawl large distances (>100 m) to find suitable conditions for pupation. Pupae start creamy white and change to a chestnut brown to black as they develop into an adult beetle form prior to emergence.





Adults

Adult SHB are dark brown to black oval-shaped beetles, usually around 4–7 mm long and 2.5–3.5 mm wide. Size varies as a result of diet during the larval stage. A partial covering of fine chestnut-coloured hairs makes them difficult to pick up. The main recognisable features are rounded clubbed antennae, the abdomen protruding from the elytra (wing cases) and the shield shape of the pronotum (covering over the thorax).

Potential damage

SHB are capable of prolific multiplication. Under laboratory conditions, 80 SHB can become more than 36,000 adult SHB by day 63. SHB can cause severe damage to honey bee colonies and stored equipment, resulting in the colony collapsing. Feeding SHB larvae causes most of the destruction by:

- Consuming bee eggs, bee brood, pollen and honey.
- Burrowing through combs and cappings, leaving them damaged. Thin-walled new combs are more susceptible than older combs.
- Defecating in and thereby contaminating honey with a yeast that causes the honey to ferment, froth and weep out of the cells. Affected frames are said to be ‘slimed’. This honey is not usable for bee or human consumption.
- Large numbers of SHB in a hive can result in the queen bee stopping laying and the colony absconding from the hive.

- Stored honey supers (full or extracted), stored hive equipment, slum gum, broken frames, unclean extracting sheds etc. are all very susceptible to SHB larval damage because no bees are present to protect them from adult beetles laying eggs. Spoilage of honey, damaged combs and increased SHB populations can result.

It is estimated that 6000 SHB larvae can be reared from a single frame of brood.

Weak or queenless hives are considered to be more susceptible to SHB damage than strong, healthy colonies. However, all colonies are susceptible to damage when large numbers of SHB are present.

Hive manipulation is also considered to increase risk to colony breakdown, especially under conditions of high SHB numbers, temperature and humidity.

Management strategies

Many of the strategies to minimise SHB damage may only need to be utilised during the summer period when temperatures reach 30°C plus and humidity is 70% or higher. Under these conditions, SHB activity increases and climatic conditions suit reproduction.

SHB management for the apiary

- Maintain strong, healthy colonies with young, productive queens. Unite weak colonies together or combine them with strong colonies. Boost weaker colonies with a frame of capped brood from strong colonies (make sure you are not transmitting AFB).
- Minimise hive manipulations. To reduce the chance of SHB reproduction after manipulation, leave the hive lid slightly ajar or place a stick under one side of the lid to increase air flow through the colony, thereby reducing humidity. Return to normal after 4–6 hours. If robbing starts, close immediately.
- Keep a high bee to comb ratio. Make sure that bees do not have too much comb relative to colony size by removing excess supers.
- Avoid leaving clearer boards on hives beyond 2 days. As the bee to comb ratio declines so does the protection provided by the bees against the SHB. This can lead to a suitably warm location for rapid SHB development, which can result in honey spoilage.
- Avoid areas of known high SHB populations during high-risk times. If SHB are a major problem where you have your bees, if possible, move them to an area with less SHB or to an area less favourable for SHB reproduction (e.g. west of the Great Dividing Range).
- Minimise cracks and crevices in the hive. Use good quality equipment and remove burr comb and items that prevent bee access to areas such as cover mats.
- Keep the bottom board free of debris. SHB can breed in this debris in low numbers unbeknownst to the beekeeper, thereby increasing the SHB population in the area.

- Take care when re-queening. The combination of hive stress, hive manipulation and an obstacle (queen cage) that prevents bee access to an area provides a set of circumstances suitable for SHB reproduction.
- Avoid using combs/equipment that are infested with any stage of the SHB life cycle. Infested or 'slimed' combs/equipment should first be decontaminated (see 'Equipment recovery') prior to re-use.
- Maintain good hygiene around the apiary. Do not leave dead colonies, combs, burr comb, beeswax scraps, etc., around the apiary that can attract and encourage SHB to breed.
- Manage varroa mite levels, hives with high levels of mite infestation are particularly susceptible to SHB.

SHB management for honey bee colonies

Commercially available

Commercial products are available to trap and reduce adult beetle populations. Most rely on the principle of SHB seeking protection away from the harassment from bees and entering a reservoir; these are effective in controlling adult beetles only in honey bee colonies. The size differential between SHB and bees is utilised, with most devices permitting SHB entry while preventing access to the larger bee.

To date, the most effective products used in the reservoirs have been vegetable oils, agricultural lime or diatomaceous earth. Be aware that anything put into the hive can result in contamination within the hive.

Felt-type materials can capture adult SHB, which become tangled in the fibres, providing bees a better opportunity to attack them. Floor vinyl backed with felt, grey geotextile (used in road construction) or some carpet types can be used as cover mats for this purpose or even woven cleaning cloths. Care should be taken as the same fibres that entangle beetles can also entangle bees, which if it were the queen, would be undesirable.

Chemical

There are approved chemical devices that can be used in the hive to kill small hive beetle. Apithor™ and TOPBAIT™ PLUS are used inside the hive to control adult beetles.

TEMEPHOS SMALL HIVE BEETLE GRANULE is an approved treatment for applying to the ground around a hive to treat developing beetles. Great care should be taken to ensure that the chemical used does not enter waterways or that birds and other wildlife are not exposed to it as it is extremely detrimental to non-target species.

SHB management for stored equipment

Techniques used for wax moth control are also effective for SHB control.

Cool rooms

The temperature thresholds for SHB survival and/or reproduction, have not yet been accurately determined.

Freezer rooms: It is known that temperatures below freezing will kill all stages of SHB.

Cold rooms: For prevention of SHB damage to equipment it is necessary to prevent SHB reproduction. This can be achieved with co temperatures of 10°C or below.

Low humidity

SHB eggs are susceptible to desiccation. SHM damage can be prevented by maintaining a low relative humidity of around or below 40%. This can be achieved using dehumidifiers in closed rooms, the use of fans to provide air movement through the equipment or by storing equipment to allow good air flow through it.

Equipment recovery after SHB damage

Individual frames with small, localised damage caused by SHB larvae can be placed into a strong colony to be cleaned. Care must be taken not to introduce SHB into the receiving hive. For more severe infestations and colony damage, infected equipment should be removed and all SHB killed (freeze, drown). The use of washing-up detergent or bleach in water kills larvae faster. Once all SHB are killed, the frames and equipment are soaked and washed thoroughly to get rid of the spoiled honey. Rinse thoroughly, dry and return washed equipment back into a strong colony to clean up any remaining damage. It may take some time for bees to accept the SHB-damaged equipment.

Acknowledgements

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