The Small Hive Beetle

A serious new threat to European apiculture

About this leaflet

This leaflet describes the Small Hive Beetle (*Aethina tumida*), a potential new threat to UK beekeeping. This beetle, indigenous to Africa, has recently spread to the USA and Australia where it has proved to be a devastating pest of European honey bees. There is a serious risk of its accidental introduction into the UK.

Introduction: the small hive beetle problem

The Small Hive Beetle, *Aethina tumida* (Murray) (commonly referred to as the 'SHB'), is a major threat to the long-term sustainability and economic prosperity of UK beekeeping and, as a consequence, to agriculture and the environment through disruption to pollination services, the value of which is estimated at up to £200 million annually.

The beetle is indigenous to Africa, where it is considered a minor pest of honey bees, and until recently was thought to be restricted to that continent. However, in 1998 it was detected in Florida and it is now widespread in the USA. It is called the small hive beetle to distinguish it from other minor pests of bee hives in Africa, known as large hive beetles.

At the time of writing, the SHB is not thought to be present in the UK.

The beetle can multiply to huge numbers within infested colonies where it eats brood, destroys combs and if uncontrolled ultimately destroys them.

The resulting economic impact on the beekeeping industry in the USA has been severe. Within two years of its discovery, at least 20,000 colonies were destroyed by the beetle, costing many millions of dollars. It has also been found in Manitoba, Canada where it arrived with beeswax imported from the USA.

In October 2002, it was found in New South Wales and Queensland, Australia. The economic consequences to the beekeeping industry in Australia are likely to be extremely serious, jeopardising bee exports, pollination services and honey production.

It is not known how the beetle reached either the USA or Australia, although in the USA shipping is considered the most likely route. By the time the beetle was detected in both countries it was already well established.

The potential implications for European apiculture are enormous, as we must now assume that the SHB could spread to Europe and that it is likely to prove as harmful here as in Australia and the USA.

Could the SHB reach the UK?

Yes it could. There is a serious risk that the SHB could be transported and introduced into the UK, for instance:

- within imported honey bees (particularly package* bees and complete colonies)
- in swarms of bees or feral colonies inadvertently carried on container shipping or airfreight
- in used beekeeping equipment, comb and beeswax
- on imported goods such as fruit
- in soil material, for instance with imported plants or carried on heavy machinery

(*A bee package is a queen plus 10,000 worker bees despatched in a sealed screened container)

Small hive beetle biology

The small hive beetle belongs to a family of scavenger beetles known as the Nitidulidae. Many of them are pests of fruit and stored food, and some like the SHB have a close association with social hymenoptera (bees, wasps and ants).

Adult beetle anatomy

Adult beetles are oval in shape, 5-7 mm long and 3-4.5 mm wide. Immediately after emergence they are coloured reddish-brown, but darken to dark brown or black when fully mature. There is some variation in size but they are about one- third the size of a worker bee. They have club shaped antennae, their bodies are broad and flattened dorso-ventrally, their wing cases (elytra) are covered with fine hairs and are short so that a few segments of the abdomen are visible.

Fig 1. View of beetle's head and club shaped antennae

Fig 2. View of beetle's abdomen showing shortened wing case (elytra)

Fig 3. Black adult SHB clearly visible on hive frame. They can also be found hiding in empty cells at the margins of the brood nest

Egg laying and Alternative Diets

Adult beetles are attracted to bee colonies. Once inside, adult beetles lay eggs in irregular masses in hive crevices or brood combs. The eggs are white and about 1.5 x 0.25 mm. Beetles can, however, survive and also lay eggs on a range of fruit, particularly melons. However, it is not known if beetles regularly eat fruit as an alternative food source, or whether this is important for their spread.

Adult beetles are able to survive for up to 2 weeks without food or water. On used brood combs they are able to survive up to 50 days.

Larval development

After 2-6 days SHB eggs hatch, and the young beetle larvae begin to feed.

SHB larvae have characteristic rows of spines on the back and 3 pairs of tiny prolegs near the head (which distinguishes them from wax moth larvae). After 10-14 days, the larvae have completed their growth and measure 10-11 mm in length.

Fig 4. Views of small hive beetle larvae showing three pairs of prolegs and distinctive rows of spines, with two large spines protruding from the rear

Reproductive potential

Small hive beetles have a huge reproductive potential. Individual female beetles are capable of producing up to a thousand eggs during their 4-6 month life.

Pupation

The next phase of the SHB's lifecycle takes place in the soil. Mature larvae will often mass on the hive bottom board and in corners of frames before moving outside. If feeding and developing on fruit, once mature they will attempt to crawl away looking for soil.

Emergence of adults

Adult beetles first emerge on average 3-4 weeks later.

About one week after emergence adult beetles search for colonies in which to lay eggs. They disperse rapidly over large distances (perhaps 5-10 miles).

CSL small hive beetle surveillance

The SHB is not thought to be present in the UK. However, from 2003, CSL bee inspectors are increasing statutory surveillance programmes to monitor for SHB presence. The NBU will use Geographical Information Systems (GIS) to prioritise this programme and target apiaries identified as "At risk". For instance, apiaries situated:

- in warmer parts of the country
- on sandy soils (suitable for SHB development)
- close to civilian and military airports
- close to freight depots and ports of entry - for instance for fruit and other foodstuffs
- close to other apiaries containing imported bees from countries where the SHB is known to be present

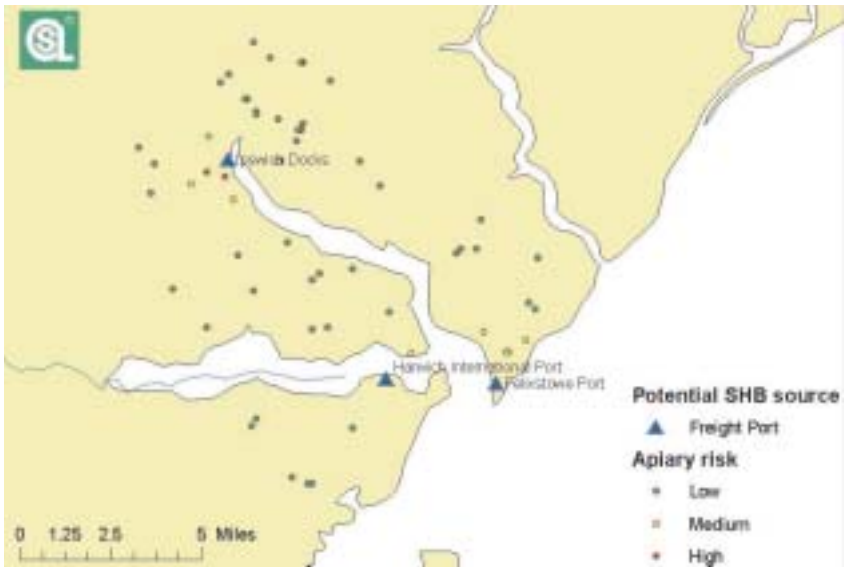


Fig 5. Use of GIS to identify apiaries at potential risk

Small hive beetle facts

Latin Name	*Aethina tumida* (Murray).
Common name	The Small Hive Beetle (often abbreviated to "SHB").
Host	Mainly lives and breeds on its primary host the honey bee - in colonies, stored comb and beekeeping equipment, but it can also survive and reproduce on certain types of fruit, particularly melons.
SHB lifecycle	Adult beetles lay large numbers of eggs in the hive. Beetle larvae eat brood, pollen and honey. Larvae crawl out of the hive to pupate. Pupation usually occurs in soil outside the hive. Preference for warm sandy soils. Adults can fly at least 5 miles to infest new colonies.
Current distribution	Indigenous to Africa. First found in United States (Florida) in 1998. Now widespread in the USA. First found in Australia (Queensland, New South Wales) in 2002. Well established. Detected in Canada (Manitoba) in 2002. Not yet established.
UK status	Exotic pest not currently considered present in the UK. Quarantine pest status with surveillance programmes in place.
Methods of spread	Spread by movement of package bees, honey bee colonies, swarms, honeycomb, beeswax, soil, and fruit. Adults can survive for two weeks without food and water, 50 days on used comb and several months on fruit.
Damage caused to beekeeping	In Africa it is a minor pest to beekeeping as native African bees have natural defences. For European honey bees in America and Australia (and therefore almost certainly the UK) the SHB is an extremely serious problem. The beetles multiply to huge numbers, their larvae tunnel through comb to eat brood, ruin stored honey, and ultimately destroy infested colonies or cause them to abscond.
Control methods used overseas	The SHB cannot be eradicated once well established. In the USA, beekeepers control SHB by using pesticides within the hive and in the surrounding soil, together with improved bee husbandry and changes to honey handling procedures.

The life cycle of the small hive beetle *(Aethina tumida)*

Life cycle is completed in the soil. Larvae mature in 10-14 days and measure 10-11mm when fully grown. They crawl out of the hive at night to pupate in the soil. Adult beetles hatch out on average 3-4 weeks later. They measure 5-7mm (one - third the size of a worker bee) and are dark reddish brown to black

1

Adults can locate colonies long distance, lay masses of eggs two - thirds the size of bee eggs in hive crevices and on combs. Eggs hatch 2-6 days later. Laying adult females often lay masses of eggs at the same time

2

Larvae and adults preferentially consume bee eggs and brood, as well as honey and pollen. Tens of thousands of larvae can be produced in each hive.

3

There can be up to 30 larvae per cell.
There is no webbing or frass like wax moth infestation

4

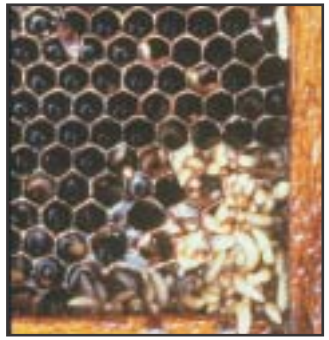
Close up of ‘Maggot-like’ SHB larva: Note spines on the dorsum and 3 prolegs near the head. Larvae reach maturity in 10-14 days and measure 11mm

5

Feeding activities of the larvae causes fermentation and spoilage of honey. Severe damage can occur in honey houses. It has a slimy appearance and smells of ‘rotten oranges’

6

Larvae often clump together in combs cells and in the corners of frames



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Further help and advice

Have I found a small hive beetle?

Check to see if those you have found match the key identification points below.

Adult beetles

- size: 5-7mm
- colour: black
- clubbed antennae
- behaviour: hides from the light
- short wing cases

Larvae

- size: 10-11mm
- colour: beige
- spines on dorsum
- 3 pairs prolegs
- Infested fruit/contaminated

Eggs

- size: 1.5 x 0.25 mm (two-thirds size of honey bee eggs)
- colour: white
- location: masses of eggs eg within fruit consignments

Sending suspect SHB samples to the NBU

Suspect SHB adults or larvae should be sent to the NBU for examination in a sealed container, such as a plastic tube or stiff cardboard box.

Please provide as many details as possible of where the sample was found (including, where possible, its Ordnance Survey map reference) and its country of origin if found on imported goods.

Do not send live beetles in the post. Kill them first by keeping them in a freezer overnight or by putting them in 70% ethanol (e.g. methylated spirits).

Sampling forms and details are available to download from the NBU website www.nationalbeeunit.com or contact the NBU Laboratory

The National Bee Unit

The Central Science Laboratory National Bee Unit (NBU) provides a statutory and advisory service to beekeepers in England and Wales. It provides diagnostic, consultancy and research services to Department for Environment, Food and Rural Affairs (Defra), National Assembly for Wales Agriculture Department (NAWAD), commerce and beekeepers. The Unit has modern facilities, including laboratories with first class computer support, as well as 150 colonies and the apiary buildings to support them.

Fig 6. Central Science Laboratory, Sand Hutton, York

UK information sources

CSL National Bee Unit (NBU)
Central Science Laboratory
National Bee Unit
Sand Hutton, York
North Yorkshire
YO41 1LZ
Tel: 01904 462510
Fax: 01904 462240
email: nbu@csl.gov.uk
Web: www.csl.gov.uk
Web: www.nationalbeeunit.com

Department for Environment, Food and Rural Affairs (Defra)
Horticulture and Potatoes Division
Eastbury House
30/34 Albert Embankment
London
SE1 7TL
Tel: 020 7238 1047/1045
Web: www.defra.gov.uk
Bee health pages:
Web: www.defra.gov.uk/hort/bees.htm

National Assembly for Wales Agriculture Department (NAWAD)
Agricultural Policy Division
Crown Buildings, Cathays Park Cardiff, CF1 3NQ
Tel: 02920 825111

Caenarfon Divisional Office
Penrallt
Caenarfon
Gwynedd
LL5 1EP
Tel: 01286 662 012
Web: www.wales.gov.uk

Bee Farmers Association of UK
Web: www.beefarmers.co.uk

British Beekeepers Association (BBKA)
National Agricultural Centre
Stoneleigh, Warwickshire
United Kingdom, CV8 2LZ
Tel: 01203 696679
Web: www.bbka.org.uk

International Bee Research Association (IBRA)
18 North Rd
Cardiff
Wales, CF10 3DT
Tel: 02920 372409
Web: www.ibra.org.uk
Email: ibra@cardiff.ac.uk

Overseas information

NSW Department of Agriculture, Australia
Web: www.agric.nsw.gov.au/reader/16402

Queensland Department of Primary Industries, Australia
Web: www.dpi.qld.gov.au/bees/

Department of Entomology, University of Georgia, USA
Small Hive Beetle Fact Sheet
Web: www.bugwood.org/factsheets/small_hive_beetle.html

Florida Department of Agriculture and Consumer Services, USA
Web: doacs.state.fl.us/~pi/enpp/ento/aethinanew.htm

United States NAPIS Cooperative Agriculture Pest Survey Programme
Web: www.ceris.purdue.edu/napis/pests/shb/

USDA Bee Research Laboratory
Beltsville, Maryland, USA

Web: www.barc.usda.gov/psi/brl/

USDA Beneficial Insects Research Center
Weslaco, Texas, USA
Web: weslaco.ars.usda.gov/biru.html

ARC Plant Protection Research Institute Honey Bee Research
Stellenbosch, South Africa
Web:
www.arc.agric.za/institutes/ppri/main/divisions/beekeeping/honeybeeresearch.htm

Acknowledgements

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Life Cycle Photographs: 1 and 5 Garry Fry, 2 and 6 Dr Patti Elzen, 3 and 7 Dr Jeff Pettis, 4 Jeff Lotz and Michael Thomas Florida Department of Agriculture and Consumer Services, Gainsville, Florida