

NATIONAL BEE UNIT

Life Cycle of the Small Hive Beetle, *Aethina tumida*



Figure 1. Adult small hive beetle, *Aethina tumida*

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The small hive beetle (SHB) (*Aethina tumida* Murray, Coleoptera; Nitidulidae) is a classic example of an insect that has inadvertently been moved to new geographical areas by an increase in global trade; in this case, honey bee and hive products.

Small hive beetles are native to sub-Saharan Africa where they exist as both scavengers and symbionts in colonies of African subspecies of Western honey bees (*Apis mellifera* L.). The beetle belongs to the family Nitidulidae. Most nitidulid species feed on decaying fruits, fermenting plant juices, fungi, carrion, flowers or pollen. It would appear that the beetle has switched hosts to honey bee

colonies opportunistically, after foraging on rotten fruit. Beetle larvae readily feed on brood and pollen inside infested colonies. Feeding activities cause honey spoilage and also devastating colony damage. In recent decades the beetle's range has spread to the US (including Hawaii in 2010), Canada and Australia (2002). This insect has the potential to have a serious impact on UK beekeeping, should it be introduced from overseas.

To date, there has been no recorded presence of the small hive beetle in the UK or, indeed, within Europe where it is classified as a notifiable pest. The only incidence within a European context was a discovery in 2004 of SHB larvae in a consignment of *A. mellifera*

queens imported illegally from Texas into Portugal. Upon this discovery, the colonies into which these queens were introduced were immediately destroyed.

Much-needed Research

In order to conduct much-needed research into the biology of this potentially serious pest species, The Food and Environment Research Agency (Fera) maintains a small culture of the small hive beetle in its Quarantine Entomology Unit (QEU). You can read more about this in an earlier article *Containing the Small Hive Beetle for Research Purposes* (Bee Craft October 2010; <https://secure.fera.defra.gov.uk/beebase/index.cfm?pageid=166>).

The QEU is a highly secure facility and is the only institute in the UK to hold a Plant Health Licence that allows the keeping of extremely small, potentially high impact, prohibited insect pests. Indeed, Fera's culture of *A. tumida* is unique, being the only one maintained anywhere in the European Community. It affords an unrivalled opportunity to study details of its life cycle.

Adult SHB (Figure 1) average 5.7 mm in length and 3.2 mm in width. The beetles vary in size. This is probably due to availability of food resources and variations in local climate. They are strong fliers and are capable of flying several kilometres, aiding their natural spread. The adult beetles are thought to be attracted to honey bee colony odours.

Small hive beetles become sexually mature about one week after developing into adults. After mating, females lay their eggs inside the hive, ovipositing in cracks and crevices or, if unhindered by worker bees, directly onto pollen or brood comb. It has been estimated that female beetles may potentially lay up to 1000 eggs in their lifetime.

Small hive beetle eggs (Figure 2) are approximately 1.4 mm long by 0.26 mm wide, pearly white and normally laid in clusters of between ten to over 30. Most beetle eggs hatch in about three days but the incubation period can continue for up to six days.

Beetle larvae are creamy-white in colour (Figures 3 and 4). They hatch out through a longitudinal slit made at the anterior end of each egg. On emergence they immediately begin to feed (Figure 3), reaching about

Figure 2. Small hive beetle eggs laid in the gap between clear plastic strips



Figure 3. Hatched larvae (in a laboratory situation) moving from plastic strips to the food source



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10 mm in length when fully grown. Once larval feeding is complete, mature larvae enter a wandering phase (Figure 4).

These larvae tend to migrate from the hive at dusk, in search of suitable substrates in which to pupate. The larval period lasts an average 13.3 days inside the bee colony. Pupation lasts between 15 and 60 days in the soil, depending on temperature. Under cooler conditions pupation is known to take longer. Research by the NBU has shown that after feeding ceases, larvae can survive for up to 48 days in their wandering phase and subsequently still develop into viable adults.

On exiting the colony, mature SHB larvae enter the soil to pupate (Figure 5). Small hive beetles spend more than three quarters of their developmental time in the soil. Once in the soil, the larvae form a suitable pupation chamber (Figure 6a) and the process of pupation into the adult beetle takes place (Figures 6a–e).

Small hive beetles constitute a potential risk to honey bees

worldwide. The robust nature of the species enables them to survive a wide range of climatic conditions. The beetles have a very high reproductive rate, with population build up occurring rapidly under favourable conditions. It is quite possible therefore that, should SHB arrive in the UK, it would be able to establish itself as a serious problem for bees and beekeepers.

With this threat in mind the NBU is carrying out research into biological and chemical control measures that could be utilised in the event of an outbreak. □

Further Information

Dr Andrew GS Cuthbertson, along with James Mathers and Lisa Blackburn, coordinates the small hive beetle research at Fera. Dr Gay Marris is Science Coordinator for the NBU.

Please send any enquires about honey bees to nbu@fera.gsi.gov.uk. Contact Bee Health Policy at beehealthinfo@fera.gsi.gov.uk for enquiries regarding Bee Health Policy and Regulatory issues.

Figure 4. Small hive beetle larvae in the wandering phase



Figure 5. Larvae on the ground surface beginning to burrow down seeking pupation sites



a



b



c



d



e

Figures 6a–e. The different stages of pupation of the small hive beetle in sand (photos taken at approximately one-week intervals)

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