BUG BIZ
Pest Management and Insect Identification Series
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Aethina tumida, Small Hive Beetle

(Coleoptera: Nitidulidae)

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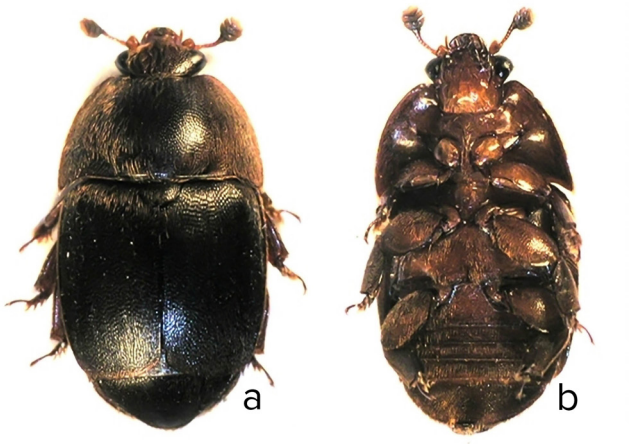
Description

The small hive beetle (*Aethina tumida*), a native to sub-Saharan Africa, is North America's most recent western honeybee (*Apis mellifera*) pest. Adult small hive beetles average 1/5 of an inch (6 mm) in length and 1/8 of an inch (3.2 mm) in width. Generally, adult females are slightly longer and heavier, but not wider, than adult males. Both male and female small hive beetle adults vary from tan to reddish brown, dark brown or black in color, with more recently emerged adults lighter in color. The top surface is uniform in color. They possess flattened, oval bodies covered with fine hairs that lie flat, pointing to the rear of the body. The wing covers (elytra) are blunt at the rear, exposing the last abdominal segment (pygidium). The antennae are clubbed, the latter comprising the last three compact segments. The legs are closely pressed to the lower surface of the body and bear thick, coarse hairs and small spines.

Small hive beetle eggs are elongate and measure about 1/20 (1.4 mm) of an inch in length, and are pearly white. Larvae are creamy-white in color, grublike in shape, and are distinctly segmented. Each of these segments bear two pairs of dorsal spines, with two larger spines (urogomphi) located at the rear. Three pairs of true legs occur along the first three body segments. The heads are brown or tan. Mature larvae are about 2/5 of an inch (10 mm) in length. Pupae are about the same size as the adults and resemble compact versions. They are light to dark tan in color, depending on the pupal stage. They become darker as they mature, just prior to adult emergence.

A number of other species in the same family, Nitidulidae (sap beetles), may occur in bee colonies, especially in feral or unthrifty managed hives. Many of these are similar in overall appearance as small hive beetle and positive identifications may require the help of a qualified insect taxonomist or diagnostician before control measures are implemented. These other species do not directly damage hives but may be indicators of a hygiene problem with the hive.



Dorsal and ventral views of an adult small hive beetle (James D. Ellis, University of Florida, Bugwood.org, Creative Commons 3.0).

Life Cycle

Female small hive beetles, once mated, lay irregular clusters of 10 to 30 eggs. Eggs are deposited in cracks and crevices of frames in strong honeybee colonies but may be deposited directly on brood comb and other active areas in weaker colonies. A female may lay 1,000 to 2,000 eggs in her lifetime. Larvae hatch one to six days after oviposition, depending on temperature and humidity, though most hatch within three days. Young larvae tunnel through combs and feed on honey, pollen and brood. This continues, depending on temperature and food availability, for five to eight days until larvae reach the late third stage (instar), known as the wandering stage, when they stop feeding. During the wandering stage, mature larvae retain their mobility for five to 10 days, leave the colony, and eventually burrow into nearby soil and prepare smooth-walled pupation cells. They become short and stout in preparation for pupation. Larvae can pupate in any type of soil, and can pause development if they cannot find an appropriate pupation site. Pupation requires around a month, but can be shorter or longer, depending on environmental conditions,

especially temperature. Following emergence, adults are active fliers during their search for susceptible honeybee colonies. Adults require about a week to reach sexual maturity. Some aspects of biology, such how isolated host colonies are located, are poorly understood and are areas of active research by bee biologists. Small hive beetles are well integrated into honeybee colonies. They exhibit a range of behaviors that protect them from attack and eventually allow them to access food sources and reproduce.

Ecological Significance and Pest Status

Small hive beetles are native to sub-Saharan Africa. They were first identified in 1867 in Old Calabar on the west coast of Africa. The species has spread to many other parts of the world where honeybees are cultivated. In their native habitat, these beetles are not considered a beekeeping pest as African honeybees possess behavioral traits that curb small hive beetle infestation. Not much was known about small hive beetles prior to their introduction to the U.S. But, western honeybees are unable to tolerate the pest, in contrast to their African counterparts. The first reported incident of small hive beetle infestation was in Florida during 1998. However, small hive beetles were introduced to the U.S. prior to that because unidentified beetle samples were taken from South Carolina during 1996 and later identified as small hive beetles during 1998. Small hive beetles quickly spread to other areas in the U.S. The first reported incident of small hive beetles in Louisiana was during 2000.

Small hive beetles do not cause damage in strong, healthy colonies. Most damage in weak western honeybee colonies is caused by small hive beetle larvae. Once emerged, larvae ravage through combs in search of honey, pollen and bee brood in combs. In addition to their depredation on food sources and brood, larvae also contaminate honey stored in colonies by defecating throughout combs. Their feces contain the yeast *Kodamaea ohmeri*, which causes the fermentation of honey. Fermented honey has a distinct odor and slimy appearance that is used for small hive beetle infestation diagnosis. Fermented honey will not be consumed by honeybees and cannot be marketed by beekeepers.

Control

Cultural control. Since small hive beetles can only cause damage in weak honeybee colonies, strengthening such colonies is the most effective approach in controlling infestations of these beetles. This approach relies on the reduction of comb-to-bee ratio, excluding beetles from the brood area, freezing dead or weakened colonies and emptying supers with infested beetles. It also relies on the prevention and treatment of brood diseases, varroa mite infestation, wax moth activity, failing queens, excessive swarming, oversupering and colony starvation. Other cultural practices such as overall sanitation of honey houses, extraction of honey from supers within two to three days, maintaining a relative humidity of 50% or less in honey houses, and establishing apiaries on drier soil have been shown to minimize small hive beetle damage.

Small hive beetle larvae on honeybee comb (James D. Ellis, University of Florida, Bugwood.org, Creative Commons 3.0).

Adult small hive beetles on comb with worker honeybees (Jessica Louque, Smithers Viscient, Bugwood.org, Creative Commons 3.0).

Chemical control. Chemical treatment of soil and honeybee colonies is not recommended as it involves the use of pesticides which can contaminate the colonies. Mechanical traps can be utilized inside honeybee colonies to reduce the number of adult small hive beetles that can produce eggs, which in turn reduces the need for

pesticides. Small hive beetle traps have small openings that allow only beetles to enter, trapping them in vegetable oil or mineral oil. Some traps have a fermenting bait to attract the adult beetles. Usually, beetles enter non-baited traps to escape from guard bees.

Biological control. Small hive beetle infestations can be controlled using biological methods that rely on natural pathogens and predators, though more research is warranted to understand host-pathogen and predator-prey relationships. Natural pathogens that have been shown to be associated with small hive beetle mortality are the soil dwelling fungi, *Aspergillus flavus* and *A. niger*, *Clonostachys rosea*, *Gliocladium catenulatum* and *Mucor plumbeus*. Predators that have been shown to control small hive beetle populations in some areas are soil infesting nematodes, parasitic wasps, flies and imported fire ants (*Solenopsis invicta*).

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