

The Small Hive Beetle (*Aethina tumida*): A Growing Threat to Global Apiculture

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Honey bee populations and the global beekeeping industry face serious threats from the Small Hive Beetle (*Aethina tumida*, Murray 1867). This beetle originated in sub-Saharan Africa, but it has spread to North America, Europe, and Australia due to global trade and its ability to thrive in different environments. The larvae cause significant damage to brood and hive products, often resulting in colony collapse. This paper summarizes the biology, distribution, life cycle, symptoms, and management techniques for SHB. The challenges related to detection, resistance, and the environmental impacts of chemical control highlight the urgent need for long-term solutions. Given the rise in beekeeping practices and trends, this paper also examines the potential risk of SHB entering India.

Keywords: *Aethina tumida*, Small Hive Beetle, Apiculture, Beekeeping

Introduction

The production of honey and other hive products, along with the pollination of food crops, depend heavily on honey bees (*Apis mellifera*), which play a key role in global agriculture. However, several stressors, such as pests, diseases, environmental changes, pesticide exposure, and nutritional issues, are increasingly threatening bee populations. The Small Hive Beetle (SHB) has emerged as a new concern due to its harmful nature and rapid spread outside its original range. Discovered in the 1990s in regions outside Africa, beekeepers in North America, Australia, and parts of Europe are now highly concerned about it. This invasive species damages hive integrity and colony health, often leading to financial losses and sometimes complete colony collapse.

Morphology and Identification

The Small Hive Beetle belongs to the Nitidulidae family and the order Coleoptera. *Aethina tumida* (Murray, 1867), is native to sub-Saharan Africa, where it lives among honey bee that have developed natural defenses against it. Asian and European honey bees are more susceptible because lack these defenses. Adults are oval, 5 to 7 mm long and 3 to 4 mm wide. Are dark brown to black and not seen easily due to quick movement and hide in debris in the hive. The larvae with three pairs of legs and a spiky surface. The larval stage is the most damaging. The larvae feed on pollen, honey, and brood, contaminating the hive with waste and causing the honey to spoil.



Figure 1

The image shows (**Figure 1**) the Small Hive Beetle (*Aethina tumida*) and its infestation in a beehive. On the left, dorsal and lateral views display the beetle's oval body, dark color, and short elytra. On the right, multiple beetles are seen inside a hive, crawling among bees on honeycomb. Their presence indicates infestation, leading to comb damage, honey spoilage, and stress in the colony. (Source: Apisantos)

Life Cycle

The hive environment is ideal for the life cycle of *Aethina tumida*. Female beetles lay clusters of eggs in the crevices of the hive, near brood or pollen stores. Eggs hatch in two to three days, and the larvae feed aggressively for ten to fourteen days. The larvae pupate in soil, for about three to four weeks and adults seek new hives to infest. In favorable conditions, is warm and humid climates, the small hive beetle complete several generations.

Symptoms and Damage

The colony suffers serious behavioral and physical issues due to SHB infestation. Slimy residue, foul smell from spoiled honey, and irregular brood patterns are common symptoms seen. Larvae destroy the comb structure, leading to weakening of the colony, and kills brood cells. Absconding is seen when the hive gets to worst condition. Adult seen in traps and moving on the comb. Colonies also face other stressors like temperature and humidity but more likely to collapse due to SHB.

Global Spread and Distribution

The Small Hive Beetle was first found in the United States in 1996 in South Carolina after previously only being seen in Africa. It spread across North America in the following years and was eventually found in Australia, Canada, Mexico, and several European countries. After SHB was confirmed in southern Italy in 2014, the European Union increased its monitoring and quarantine measures. The global movement of queen bees, honey bee colonies, and beekeeping supplies has played a significant role in its spread. The beetle is a high-risk quarantine pest in uninfested areas because of its strong flying ability and adaptability to both tropical and temperate climates, which increases its potential for invasion.

Factors Facilitating Spread

The beetle's adaptability to different settings, the lack of natural adversaries in recently invaded areas, and human-driven bee and equipment mobility are the primary factors driving SHB spread. The population spread quickly because of the absence of biological control mechanisms. It can thrive in various of climates, from temperate zones to hot tropical regions increasing its danger to beekeeping systems.

Management strategies

To effectively manage SHB, it needs cumulative approach that includes mechanical, cultural, biological, and chemical techniques. Infection can be avoided by minimising hive area, by keeping the hive clean and robust population. Larval pupation can be stopped if the soil surrounding hives is disturbed. Adult beetles can be captured using in-hive traps with oil or vinegar attractants, found to be one of the effective strategies. The entomopathogenic nematodes, *Steinernema spp.*, to the soil to kill pupating larvae is one way to control using biological control. Permethrin soil drenches and coumaphos-based strips, such CheckMite+, are the chemical control solutions. However, the bees are sensitive to these chemicals, hence to be handled carefully.

Challenges in Management

The control measures are secretive in nature; the beetle is able to elude identification and surface treatments. Use of chemicals might affect non-target species and result in resistance. Also, the beekeepers lack the skills or expertise necessary for diagnosis hence many in many areas, infestations go undetected. The absence of laws requiring early diagnosis in non-infested nations makes prevention measures much more difficult.

Future Prospects

The development of bee strains with improved defensive or hygienic behaviours, better trap designs, and improved early detection systems should be the main goals of future control strategies. The development of SHB semiochemicals and attractants might result in lure-and-kill systems that are more successful. To curb the beetle's spread, stringent quarantine enforcement, community-level monitoring, and international collaboration will be required. Sustainable biocontrol alternatives and less dependence on chemical pesticides are probably going to be key components of SHB management in the future.

Relevance to India

While the Small Hive Beetle has not been officially recorded in India, it is considered a high-risk pest due to the increasing global traffic in bees and beekeeping equipment, along with the growing apiculture industry. SHB is classified as an alien quarantine pest by the National Bee Board (NBB) and the Indian Council of Agricultural Research (ICAR). High-risk areas, including border states like Tamil Nadu, Uttarakhand, and Punjab, are under surveillance. The introduction of SHB could lead to rapid and widespread infestations because of the country's vast network of migratory and small-scale beekeepers. To protect Indian beekeeping, strong quarantine enforcement, beekeeper education, and research on local management strategies are urgently needed.

Conclusion

The Small Hive Beetle poses a serious and growing threat to beekeeping businesses worldwide. It is a significant pest of honey bee colonies due to its damaging larval feeding, adaptability, and rapid reproduction. Integrated pest management techniques can help keep SHB numbers manageable, even if complete eradication may not be achievable. Proactive research initiatives, international cooperation, and careful monitoring are essential to reduce the harm this invasive pest causes and ensure the ongoing health of pollinator systems around the globe.

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