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Scientific note

A scientific note on the threat of small hive beetles (*Aethina tumida* Murray) to bumble bee (*Bombus* spp.) colonies in the United States

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The recent arrival of small hive beetles, *Aethina tumida* Murray (Coleoptera, Nitidulidae) into the southeastern United States has prompted serious concerns regarding the threat this honey bee (*Apis mellifera* L.) pest poses to related bee species [1]. This is especially true for bumble bees, *Bombus* spp. (Hymenoptera, Apidae), as they share similar biological traits with honey bees: nectar and pollen collection, wax comb construction, etc. Given the role of bumble bee pollination in native plant reproduction, wildlife food availability and commercial crop pollination, it was decided to evaluate the consequences of artificial *A. tumida* infestation of commercial bumble bee (*B. impatiens* Cresson) colonies under laboratory conditions.

Four bumble bee colonies, each containing 100–200 adult bees and housed in individual containment units, were maintained in quarantine for 28 d. On 5 February 1999, 3 of the bee colonies were artificially infested with 20 *A. tumida* adults; a fourth colony was not infested and served as a control. Beetle-infested and control colonies were sacrificed on d 14 (infested colony 1), 17 (infested colony 2 and control colony), and 24 (infested colony 3) after the adult beetles were introduced to evaluate colony status and beetle population over time. Soil was provided for the development of small hive beetle pupae into adults.

At the termination of the study, between 1 900 and 4 200 *A. tumida* larvae, pupae, and new adults were recovered from each of the colonies to which adult beetles were introduced. These included 483 to 3 623 larvae, 300–1 000 pupae, and 200–500 new adult beetles per infested containment unit. No small hive beetles of any stage were found in the control colony when sacrificed. Beetle-infested colonies also had fewer live adult bees, more dead adult bees (and a greater proportion of dead bees which were no longer intact), and greater comb damage than did the control colony. When sacrificed, the control colony contained 57 live adult bees, 134 intact dead adult bees, 9 dead bees that were no longer intact, and the comb had only minor damage. This comb damage was subsequently attributed to a nest scavenger (Indianmeal moth, *Plodia interpunctella* Hubner). In contrast, infested colony 1 contained 23 live bees, 33 intact dead bees, and 139 dead bees that were no longer intact (quantified by the number of recovered bee head capsules). Infested colony 2 contained 8 live adult bees, 7 dead intact bees, and 139 dead bees that were no longer intact. At the time of sacrifice, infested colony 3 contained no live adult bees, 11 dead intact bees, and 145 dead bees that were no longer intact. Comb damage in all infested colonies was considerable in comparison to the control colony, and was attributed to the activities of the beetle larvae. Infested colony 1 had several intact empty storage cells when sacrificed, whereas the combs of infested colonies 2 and 3 were completely destroyed.

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A new generation of small hive beetles was produced from adult to adult in each beetle-infested containment unit, thus demonstrating their ability to complete an entire life-cycle in association with *Bombus* colonies, at least under laboratory conditions.

It is currently unknown if small hive beetles are able to locate and invade natural, soil-dwelling bumble bee colonies or commercial bumble bee colonies. However, given the rapid spread of small hive beetles throughout the apiaries of the southeastern United States, bumble bee colonies may be in jeopardy. The ramifications of such an eventuality could be ecologically devastating in beetle-infested areas. Studies evaluating the infestation risk to wild *Bombus* colonies, as well as those used in commercial greenhouse and field pollination situations, are underway [2].

Note scientifique sur la menace que représente le petit coléoptère des ruches (*Aethina tumida* Murray) pour les colonies de bourdons (*Bombus* spp.) aux États-Unis.

Eine wissenschaftliche Notiz über die Gefährdung von Hummelvölkern (*Bombus* spp.) durch den Kleinen Beutenkäfer (*Aethina tumida* Murray) in den Vereinigten Staaten.

REFERENCES

[1] Elzen P.J., Baxter J.R., Westervelt D., Randall C., Delaplane K.S., Cutts L., Wilson W.T., Field control and biology studies of a new pest species, *Aethina tumida* Murray (Coleoptera, Nitidulinae), attacking European honey bees in the western hemisphere, Apidologie 30 (1999) 361–366.

[2] Stanghellini M.S., et al. Bumble bee colonies as potential alternative hosts for the small hive beetle (*Aethina tumida* Murray), Am. Bee J. (2000) in press.