A Scientific Note on the Occurrence of the Small Hive Beetle (Aethina tumida Murray) in Southern Quebec

by PIERRE GIOVENAZZO1 and CLAUDE BOUCHER2

In a recent editorial, Neumann and Ellis (Neumann and Ellis 2008) describe the most recent findings regarding the dispersion and presence of the small hive beetle (SHB) Aethina tumida around the world. These authors indicate that from the initial SHB endemic African range and its first observation in Florida State in 1998, the SHB has rapidly spread to other areas in the USA and is now present in most beekeeping countries. This rapid dispersal is thought to be a consequence of beekeeper-assisted movement of beetle infested colonies, package bees and beekeeping equipment. SHB has been found in Canada occasionally since 2002, but has not been acknowledged as a permanent invasive species (Manitoba provincial Apiarist, Réal Lafrénière personal communication; Alberta provincial Apiarist, Medhat Nasr personal communication). In this scientific note we report the recent finding of SHB in a southern region of the province of Québec (Canada) and present results from our SHB 2009 survey in this region.

In September 2008, Quebec provincial bee inspectors (Ministère de l’agriculture, des pêcheries et de l’alimentation du Québec) found SHB-infested hives in a region located near the Canada-USA border (Figure 1). The initial survey found 6 different infested bee yards in this isolated region and observed different stages of the SHB life cycle (eggs, larvae and adults) in one of the bee yards. Genomic analysis of SHB sampled on invasion sites has identified USA haplotype (Boucher 2009). This information suggested a northern expansion of SHB populations from the USA. The provincial animal health division was concerned about the northern expansion of this new honey bee colony scavenger and asked our bee research team (Centre de recherche en sciences animales de Deschambault, CRSAD) to investigate this problem. The aim of our work for 2009 was to survey and monitor this SHB invasion.

During the month of May 2009, the CRSAD bee research team checked all existing Québec hives in a 20 km radius surrounding SHB positive bee yards identified in fall of 2008 (Figure 1). Over 250 colonies were examined for the presence of the SHB by visual inspection of each hive as described by Neumann and Hoffmann (Neumann and Hoffmann 2008). In all the hives inspected (including the ones from the infected bee yards in September 2008) we did not find any SHB. This absence suggested that SHB did not survive wintering. But we suspected that the number of surviving wintering beetles was probably very low and that they could be difficult to detect by a visual inspection.

At the beginning of July 2009, the CRSAD team placed 40 sentinel hives in seven different sites along the Canada-USA border from the city of Dundee to Franklin (Figure 2). The sentinel hives were made from 2 frames of brood and bees plus one honey-filled frame placed in a standard Langstroth hive. A trapping device using a piece (15 x 15cm) of corrugated Coroplast™ (5mm openings) was installed on the bottom board of each hive according to Elzen (Elzen, Baxter et al. 1999). Sentinel sites were visited at three week intervals until November 2009. During each visit, each hive was thoroughly inspected as previously described and trapping devices were checked for the presence of SHB.

The first adult beetles were found in two of the sentinel bee yards closest to the USA border (from one to three beetles per infected hive, Table 1). Beetles were found

<table>
<thead>
<tr>
<th>Site</th>
<th>July 20th</th>
<th>Aug. 19th</th>
<th>Sept. 8th</th>
<th>Oct. 9th</th>
<th>Nov. 2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1 Amhurst (8 hives)</td>
<td>0</td>
<td>9 (in 5 hives)</td>
<td>10 (in 6 hives)</td>
<td>6 (in 5 hives)</td>
<td>2 (in 2 hives)</td>
</tr>
<tr>
<td>Site 2 Andrew (4 hives)</td>
<td>0</td>
<td>5 (in 4 hives)</td>
<td>6 (in 4 hives)</td>
<td>10 (in 3 hives)</td>
<td>3 (in 2 hives)</td>
</tr>
<tr>
<td>Site 3 Leblanc (8 hives)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Site 4 Ruby (4 hives)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Site 5 Pilon (8 hives)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3 (in 1 hive)</td>
<td>0</td>
</tr>
<tr>
<td>Site 6 Lussier (4 hives)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Site 7 Fortin (4 hives)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1. Adult Small hive beetle numbers found during the 2009 inspections in the different sentinel sites along the Canada-USA border. The location of each site is shown in figures 1 and 2.

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This beekeeper-assisted movement of SHB reproduce and their populations increase. In the southern USA states the SHB can back down south for a new pollination season, in October and November and moved northern colonies. USA beekeepers transport hives used for fruit pollination in the southern regions via transportation of beetle-infested USA bee yards to the USA-Canada border. Near the Canada border from the USA south, beetle-infested colonies. USA beekeepers transport beetle-infested USA bee yards to the USA-Canada border. Near the Canada border from the USA south, beetle-infested colonies.

During the July and August surveys, we also visited some USA bee yards near the USA-Canada border and visually inspected hives present there. On these occasions, we found SHB infestation in all of the USA bee yards visited. The owner of these hives, who we thanked for his cooperation, informed us that they were brought where the states of Florida and Virginia at the beginning of July by two USA beekeepers (David Hackenburg, personal communication). All life stages of the SHB were found in these USA bee yards with the highest infestations detected in abandoned hive boxes and weak hives. One of these SHB-infected USA bee yards was about 1 km from our sentinel sites 1 and 2, through a deforested power line zone crossing the Canada-USA border.

We propose that the beetles are brought near the Canada border from the USA southern regions via transportation of beetle-infested colonies. USA beekeepers transport hives used for fruit pollination in the southern American states and move them to the northern states for summer colony buildup, colony splitting and honey production. In doing so, they contribute to the northern dispersal of SHB. These hives are again transported in October and November and moved back down south for a new pollination season. In the southern USA states the SHB can reproduce and their populations increase. This beekeeper-assisted movement of SHB infested colonies in June/July causes infestation of Canadian hives near the border. Recent work by Spiewok (Spiewok, Pettis et al. 2007; Spiewok, Duncan et al. 2008) showed that dispersal of SHB between apiaries is possible and is dependent of apiary density and SHB population levels. Our observations of the USA hives showed that SHB populations were thriving only 1 km away from our sentinel hives and their migration was facilitated by a deforested power line corridor.

We do not know yet if SHB are able to complete their life cycle in a colder environment and if or how they will overwinter in our regions within bee clusters. Adult SHB have been reported in winter clusters of overwintering bees (Evans, Pettis et al. 2000; Hood 2000; Pettis and Shimanuki 2000). This information suggests that surviving winter SHB could eventually be present in our infested hives. A recent study measured high levels (83%) of overwintering SHB adult mortality in Maryland, USA (Peter Neumann, personal communication). This low winter survival rate could explain why they did not turn up in our 2009 spring survey and might suggest that they will not be able to establish a permanent population as seen in two other Canadian provinces (Alberta and Manitoba).

We will continue to study and monitor this SHB occurrence in the southern Quebec and our research goals for 2010-2011 are to verify their wintering capacity and to check if they can achieve their complete life cycle during our beekeeping season.

References