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NOTES AND COMMENTS

Current status of small hive beetle infestation in the Philippines

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In June 2014, the small hive beetle (SHB), *Aethina tumida* Murray was first detected in Asia specifically in Lupon, Davao Oriental, Philippines infesting *Apis mellifera* colonies. It is not known how the beetles were introduced into the country. However, queen shipment from other countries is thought to be the likely route. Between June 2014 and November 2014, several beekeepers had lost all of their *A. mellifera* colonies (687) from SHB infestations in Davao Oriental. Monitoring of the remaining apiary sites was conducted from 26 November 2014 to 22 December 2015 in Davao (Lupon, Tagum, Panabo) (34 colonies), General Santos (6 colonies), Bukidnon (500 colonies), and Cagayan de Oro (26 colonies). All the apiary sites except Bukidnon and Cagayan de Oro were positive for SHB. Infested colonies were managed using modified beetle blaster traps, physical removal of adult beetles, and apiary and hive hygiene practices.

When SHB-free colonies of *Apis cerana* and stingless bee (Tetragonula biroi) were transferred to SHB-infested apiary, the *A. cerana* colonies were invaded immediately a day after and absconded after a week. Stingless bee colonies were not at all infested by SHB and remained strong. All the apiary sites in Visayas (312 colonies) and Luzon (989 colonies) were SHB free. Further studies on the biology and host range of SHB in Asia are deemed necessary to contain their spread and preserve the diversity of native bees in the region.

Keywords: small hive beetle; *Aethina tumida*; Asian bees; diversity; Philippines

Introduction

The distribution of the small hive beetle (SHB), *Aethina tumida* is rapidly expanding. From Sub-Saharan Africa, SHB has successfully invaded other continents. It is present in Australia and North America, and has recently been detected in Europe (Neumann et al., 2016). In June 2014, it was first detected in Asia, specifically in Davao Oriental, Philippines infesting *Apis mellifera* colonies (Brion, 2015). In November 2014, the University of the Philippines Los Baños initiated a Quick Response Service. This service entailed interviews with individual beekeepers and examination of colonies for the presence of SHB.

Apiaries (1,869 colonies) in 18 provinces across the Philippines (Figure 1) were inspected for the presence of SHB. When an apiary had five colonies or fewer, all colonies were inspected. Otherwise, only the weakest colonies (6–10) were examined, since they are known to be more prone to SHB invasion. Individual frames and bottom boards were inspected.

Prior to the detection of SHB in Mindanao, nearly all colonies of *A. mellifera* (687 colonies, 6 beekeepers) in Davao Oriental and eight in General Santos (one beekeeper) succumbed to SHB infestations between June 2014 and November 2014. Monitoring of the remaining apiary sites was conducted from 26 November 2014 to 22 December 2015 in Davao (Lupon, Tagum, Panabo) (34 colonies), General Santos (6 colonies), Bukidnon (500 colonies), and Cagayan de Oro (26 colonies). All the apiary sites except Bukidnon and Cagayan de Oro were positive for SHB.

One case of stingless bee (*Tetragonula* spp.) colony loss was reported in Lupon, Davao. It occurred when a stack of empty boxes was relocated unknowingly dividing the wild colony. The weaker part was attacked by SHB issuing hundreds of larvae. The stronger part remained SHB free. Two other stingless bee colonies in Panabo, Davao were not infested with SHB. Damage by SHB to *Tetragonula carbonaria* has been observed in Australia, despite their ability to mummify live SHBs (Greco et al., 2010). Whether or not all species of stingless bees have similar responses to SHB is unknown. Furthermore, three SHB-free *Apis cerana* colonies that were brought from Luzon into an SHB-infested apiary were invaded by three (3) SHBs, one day post arrival. Although *A. cerana* is known for its defensive behavior against predators, the three colonies absconded after seven days. This quick invasion by SHB and the absconding response by *A. cerana* needs further studies.

The degree of SHB infestation in surviving *A. mellifera* colonies in Davao Oriental was also observed between November 2014 and June 2015 (Table 1). All colonies were housed in standard hives located in three sites. In each colony, SHBs were trapped using modified Beetle Blaster traps, live adult SHBs removed, and bee population estimated (Frake, de Guzman, & Rinderer

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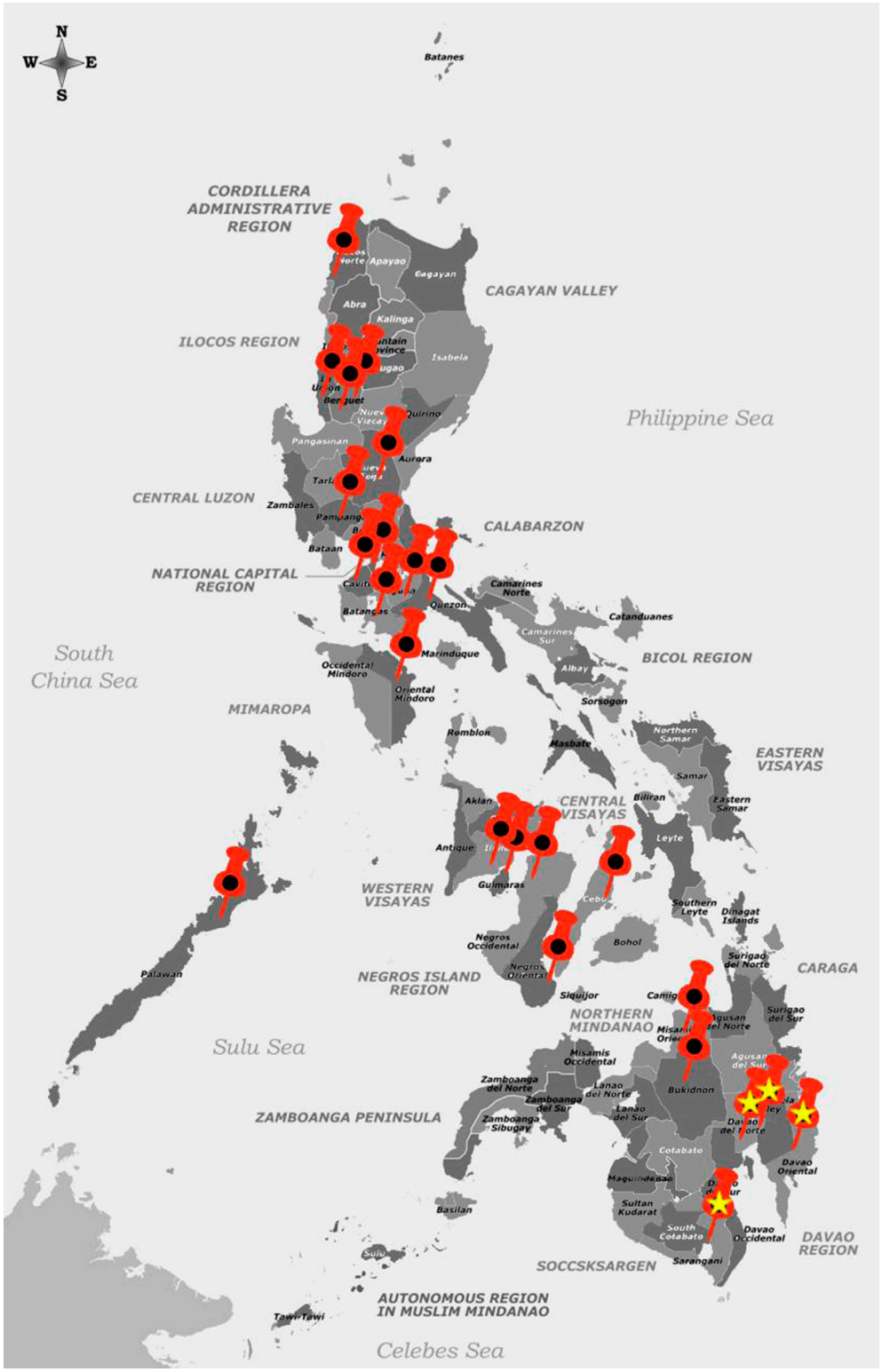

Figure 1. Map of the Philippines showing the provinces (Luzon = 13, Visayas = 5, Mindanao = 6) where colony inspections were conducted. Solid circle indicates no SHB was detected; solid star indicates SHBs were detected.

et al., 2009). Overall, SHB infestations were low with the highest number recorded in November 2014. SHB numbers decreased thereafter, probably due to the death of the weakest test colonies (40%) and the removal of live beetles from the colonies during examination. New invading beetles probably came from dead test colonies or wild colonies of *A. cerana*.

In Luzon, *A. mellifera* colonies in the provinces of Benguet (140 colonies) Ilocos Sur (18 colonies), La Union (71 colonies), Nueva Ecija (two colonies),

Table 1. Colony strength and number of adult small hive beetles trapped and collected from surviving *Apis mellifera* colonies in Davao Oriental, Philippines at various sampling dates.

		26/11/2014		31/3/2015		22/4/2015		5/6/2015		
Site	Colony #	# Frames with adult bees (frames with brood)	# adult SHB	# Frames with adult bees (frames with brood)	# adult SHB	# Frames with adult bees (frames with brood)	# adult SHB	# Frames with adult bees (frames with brood)	# adult SHB	Total adult SHB
1	1	7 (1)	4	5 (3)	8	6 (3)	7	8 (4)	5	24
	2	14 (4)	9	14 (6)	10	14 (6)	5	14 (8)	3	27
	3	14 (3)	7	14 (4)	3	14 (4)	5	15 (6)	5	20
	4	7 (1)	7	7 (2)	4	7 (3)	7	7 (4)	5	23
	5	12 (2)	12	12 (4)	4	12 (5)	4	12 (7)	3	23
	6	10 (2)	10	10 (3)	5	10 (4)	4	10 (6)	3	22
	7	4 (1)	4	4 (2)	5	Dead				9
	8	3 (1)	3	Dead						3
	9	3 (0)	3	Dead						3
	10	12 (4)	12	12 (5)	8	13 (7)	6	13 (8)	5	31
	11	10 (3)	10	10 (4)	6	10 (6)	2	10 (7)	4	22
2	1	7 (2)	9	7 (3)	6	7 (4)	4	7 (4)	3	22
	2	6 (0)	6	Dead						6
	3	5 (2)	3	6 (3)	3	6 (2)	4	6 (3)	2	12
	4	6 (1)	11	6 (2)	4	6 (2)	3	6 (1)	1	19
	5	3 (0)	4	Dead						4
	6	4 (0)	2	Dead						2
	7	3 (1)	9	Dead						9
3	1	4 (2)	8	4 (3)	6	7 (4)	4	7 (4)	3	21
	2	5 (2)	4	5 (2)	3	6 (2)	4	6 (3)	2	13
	3	5 (1)	11	5 (2)	4	6 (2)	3	6 (1)	1	19
	4	4 (0)	4	Dead						4
	5	4 (0)	5	Dead						5
Total			157		79		62		45	343
Avg.		6.6 (1.4)	6.8	8.1 (3.2)	5.3	8.9 (3.9)	4.4	9.1 (5.5)	3.2	14.9

Pampanga (12 colonies), Metro Manila (28 colonies), Laguna (43 colonies), Batangas (280 colonies), Cavite (276 colonies), Quezon (32 colonies), Oriental Mindoro (5 colonies), and Palawan (84 colonies) were inspected for the presence of SHB. Boxed colonies of *Tetragonula biroi* (10 apiaries), and wild colonies of *A. cerana* (1), *Apis andreniformis* (3), *Apis dorsata dorsata* (2), and *Apis dorsata breviligula* (1) were also examined. In Visayas, *A. mellifera* colonies in Cebu (185 colonies), Negros Occidental (50 colonies), and Iloilo (77 colonies) provinces were examined. All colonies were SHB free.

For each stingless bee colony, the nest was detached from the bottom of the box and examined for SHBs. Only one brood comb and ~500 adult bees were subsampled from the wild *A. cerana* colony. For *A. andreniformis*, the whole nests (comb and bees) were collected. The whole comb and ~500 bees were collected for each of the *A. dorsata* colonies.

In addition to SHB, a myriad of factors contributed to loss of *A. mellifera* colonies in Mindanao. All beekeepers surveyed, considered *Varroa* spp. as the major problem. Concurrent infestations of varroa and *Tropilaelaps* spp. were only observed in Palawan. Despite regular formic acid and fluvalinate treatments, nearly all *A. mellifera* colonies had high mite infestations, as evidenced by the presence of bees with wing deformities, mites on bees, and bottom boards. Most of these colonies were headed by old queens. Replacement queens are unavailable. Queens are imported from abroad but the recent changes in importation policies slowed down the process. Hence, colonies are weak, making them vulnerable to SHB damage.

So far, SHB is confined in Mindanao (southern Philippines). At present, no quarantine has been enacted to prohibit inter-island movement of colonies. However, beekeepers are advised not to move colonies and other beekeeping equipment and supplies to prevent the spread of SHB throughout the country, and are encouraged to employ good management practices. This first introduction of SHB into Asia is alarming. Asia not only offers warm and humid conditions that shorten SHB development (de Guzman & Frake, 2007) but also is the home to nine recognized honey bee species, several species of stingless and bumble bees. SHB is known to infest bumble bees (Spiewok & Neumann, 2006). Thus, SHB infestations can be serious and the potential economic consequences may be immense. Further studies on the host range of SHB in Asia are deemed necessary. Promoting caution and awareness about the dangers of this invasive pest is also needed to contain their spread and preserve the diversity of bees in Asia.

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Disclosure statement

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