



Figure 1. Enlarged photo of an adult *Hypothenemus hampei*.

Coffee Berry Borer

Hypothenemus hampei (Ferrari)

(Coleoptera: Curculionidae: Scolytinae)

Introduction. On September 2, 2010, Dr. H.C. Bittenbender (University of Hawaii CTAHR) and graduate student Elsie Burbano (University of Hawaii PEPS) alerted The Hawaii Department of Agriculture (HDOA) of beetles heavily infesting coffee berries, *Coffea arabica*, in the Kona region of Hawaii Island (Big Island).

Adult beetles dissected from affected coffee fruit were sent for identification to several beetle experts. Dr. G. A. Samuelson (Bishop Museum) initially identified this damaging pest as *Hypothenemus hampei*, the Coffee Berry Borer (CBB). Subsequently, on September 8, 2010, Dr. Natalia Vandenberg (USDA-ARS Systematic Entomology Laboratory) made a final determination, confirming the identity of *H. hampei* (Ferrari), the world's most destructive insect coffee pest.¹

Description. Adult female beetles range in size from 1.4-1.7 mm (1/16 inch), with males much smaller. When adult beetles emerge from pupation, their abdomen appears a blackish-brown, with a lighter brown pronotum. As they reach maturity, their bodies darken to black.

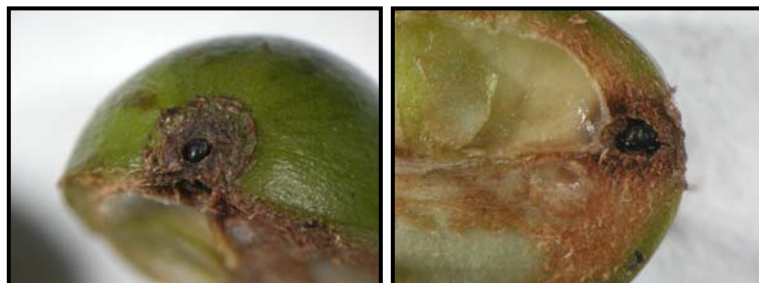
CBB is extremely similar in appearance to *Hypothenemus obscurus*, the Tropical Nut Borer, and *Xylosandrus compactus*, the Black Twig Borer, which are both found on coffee plants in Hawaii. Physical differences can only be spotted with a microscope, and sometimes only by an expert.

Life History. CBB spends most of its life inside coffee berries. Beetles take 28-34 days to complete their development- Egg (4d), larvae (15d), pupae (7d). Females live up to 5-6 months.

Female beetles bore holes into mature and immature coffee berries, still attached to the tree, through the scar on the blossom end of the berry. They create "galleries" in the berries, where they deposit their eggs. Once eggs hatch, beetles larvae eat their way through the berry and into the bean, or endosperm, of the seed.^{2, cited by 3} Reproduction can continue in berries that fall to the ground.³ Adult females remain in the berries once eggs are laid. The progeny will emerge to find new berries to deposit their eggs.^{4, 5}



Figure 2. Enlarged top view of CBB.



Figures 3 & 4. Adult female beginning to bore into green coffee berry to deposit her eggs.

Damage. One noticeable characteristic for preliminary field identification of CBB is its point of entry into the coffee berry. While the Tropical Nut Borer and Black Twig Borer may enter the berry from the sides, CBB bores through the scar at the blossom end of the fruit. In addition, the Black Twig Borer will readily infest coffee branches, while CBB will only attack the berries.



Figures 5 & 6. Entrance holes at blossom end of berry (Left). Larva in gallery, also showing secondary fungus (Right).

In addition to feeding damage by the beetle, coffee beans are injured by secondary fungal and bacterial infection, and further insect attack. The combined damage can reduce yield, lower the quality, and possibly destroy the entire bean.^{6, 7, 8, cited by 3, 5} Unlike the Black Twig Borer, which has been in Hawaii for over 50 years, CBB can reduce coffee yields by up to 90% in some coffee producing areas of the world.^{9, cited by 10}

Hosts. CBB's preferable host is *Coffea arabica* and *C. canephora*. However, as cited by Damon, this pest is recorded from various alternate hosts, including *Ixora*, *Passiflora* sp., blackberry, corn, hibiscus, *Acacia* spp., *Cassia* spp. (shower tree), *Leucaena leucocephala* (haole koa), *Mimosa pudica* (sleeping grass), etc.^{11, 12, 8}

Distribution. The Coffee Berry Borer is native to Central Africa^{13, cited by 5}, and has now invaded every coffee-producing region worldwide, with exception of Nepal and Papua New Guinea.⁵ Currently in Hawaii, CBB distribution is limited to the south Kona region of Hawaii Island from Kainaliu to Opihiale.

Control. There are no chemical insecticides available in Hawaii that can effectively control CBB. The beetles spend most of their lives inside the fruit, therefore chemical control strategies are limited⁵. However, research on other sustainable control options remains ongoing. According to Damon³, safer, but more labor-intensive sanitation methods may be coffee growers' best option, especially for small producers.

Dr. Bittenbender, is working with coffee growers management techniques including cultural control options specific for Hawaii's growing conditions.



Figure 7. Opened coffee berry with damage inside.

USDA/ARS is researching the use of pheromones for monitoring and control, as well as the use of *Beauveria bassiana*, a naturally occurring fungal enemy of insects. HDOA is conducting

delimiting surveys to determine the extent of the damage, is implementing quarantine restrictions, and is investigating biological control options.

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Figure 8. CBB larvae devouring coffee bean.

and HDOA staff members P. Conant and K. Onuma for their rapid response and surveys.

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