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Coelopidae

A family of flies (order Diptera). They commonly are known as seaweed flies.

► Flies

Coenagrionidae

A family of damselflies (order Odonata). They commonly are known as narrow-winged damselflies.

► Dragonflies and Damselflies

Coevolution

Reciprocal, adaptive changes in traits of two populations.

Coffee Bean Rot

Stink bugs introduce fungi into coffee berries while feeding.

► Transmission of Plant Diseases by Insects

Coffee Berry Borer, *Hypothenemus hampei* (Ferrari) (Coleoptera: Curculionidae: Scolytinae)

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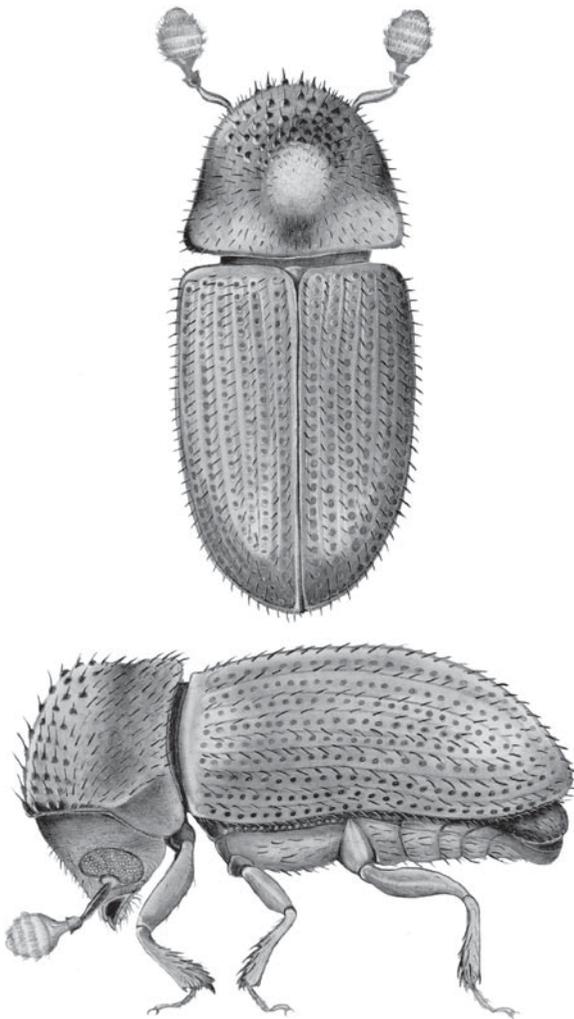
The coffee berry borer, *Hypothenemus hampei* (Ferrari), known throughout Latin America as

“la broca del café,” is the most devastating insect pest of coffee throughout the world. This minute insect (0.5–0.8 mm length and 0.2 mm wide) is endemic to Central Africa, and has now spread to most coffee growing regions throughout the world. Infestation levels can be quite high (e.g., Uganda 80%, Colombia 60%, Jamaica 58–85%, Tanzania 90%, Malaysia 50–90%, and Mexico 60%). It is striking that out of more than 850 insects reported on coffee, the coffee berry borer is the only one that has adapted to use the seed of *Coffea arabica* and *Coffea canephora* (=robusta) as its food source.

Damage begins when an adult female (Fig. 72) bores a hole into the coffee berry and deposits her eggs; larvae feed on the coffee seed, lowering its quality and possibly causing abscission of the berry. An interesting aspect of the insect’s biology is the highly skewed sex ratio favoring females (10:1), which contributes to a high reproductive capacity. *Wolbachia*, a maternally inherited bacterium known to induce parthenogenetic development and skewed sex ratios favoring females, has been detected in coffee berry borers from 11 different countries.

When larvae molt into adults, they mate with their siblings inside the berry; therefore, once females emerge, they are inseminated and ready to deposit eggs into another coffee berry. In contrast to females, males remain in the berry, and are unable to fly. Thus, insect development inside the coffee berry makes this insect very difficult to control. The highly toxic chlorinated hydrocarbon endosulfan has been widely used against the coffee berry borer but some countries have banned its use. Also, the insect has developed resistance to this product. The lack of safe and effective chemical control strategies has led to strong efforts by coffee scientists in many countries to develop biological control methods relying on parasitoids and fungal entomopathogens.

Four of the most common coffee berry borer parasitoids originate in Africa: two bethylids (*Prorops nasuta* Waterston and *Cephalonomia stephanoderis* Betrem), one eulophid (*Phymastichus coffea* La Salle), and one braconid (*Heterospilus coffeicola* Schmiedeknecht). Some of these have been introduced



Coffee Berry Borer, *Hypothenemus hampei* (Ferrari) (Coleoptera: Curculionidae: Scolytinae), Figure 72 Adult coffee berry borer, *Hypothenemus hampei*. Drawing by Ann Simpkins (USDA).

in coffee producing countries (e.g., Colombia, Jamaica, Mexico) in an attempt to reduce coffee berry borer damage, but their mass production remains expensive due to the need for coffee seeds in which to rear the coffee berry borers used to rear the parasitoids.

The most common fungal entomopathogen isolated from the coffee berry borer is *Beauveria bassiana*, although *Isaria fumosorosea*, *Paecilomyces lilacinus*, and *Metarhizium anisopliae* have also been reported to a lesser extent. The use of *B. bassiana* as a fungal endophyte to control the coffee

berry borer is being aggressively studied. The insect has also been shown to be associated with 40 species of fungi in 22 genera. Two nematodes have been reported as parasites of the coffee berry borer: *Panagrolaimus* sp. in India and *Metaparasitylenchus hypothenemi* in Mexico.

Cultural practices such as complete collection of berries on the tree and ground immediately after harvest could greatly reduce coffee berry borer population levels. However, this laborious strategy is not considered a feasible or cost-effective alternative.

► Coffee Pests and their Management

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