UT Extension
SP503-I

Insects

Identifying the Flatheaded Appletree Borer (*Chrysobothris femorata*) and Other Buprestid Beetle Species in Tennessee

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Introduction

The flatheaded appletree borer, *Chrysobothris femorata* (Olivier) (FHATB) is a well-documented, native pest of deciduous trees. It has a wide host range and is particularly problematic in commercial nurseries and urban landscapes, where it can cause rapid decline of economically important hosts. When infestations are high, FHATB has been known to attack healthy trees as well as those stressed by drought, plant disease, mechanical injury and other environmental factors. Its distribution is ubiquitous, covering the entire continental United States and extending into Canada.

Life History

Throughout its range, FHATB completes one generation per year. Adult females lay eggs on the sunny side of trees in late spring and throughout the summer months, ovipositing after a meal of tender bark is taken from the host plant. Eggs hatch about seven days later, at which time larvae chew through the bottom of the egg directly into the host tree, avoiding desiccation and predation. Inside the host, larvae feed on the actively dividing cambium tissues, in addition to sapwood. Galleries, which are feeding paths made by larvae, maintain optimal humidity for larval growth. Feeding activity continues even in cold winter months on sun-warmed portions of the trunk. When fully developed, larvae bore into the heartwood and form pupal chambers with entrances that are tightly plugged with frass. Frass appears as sawdust particles after passage of the plant tissues through the beetle digestive tract. Pupation occurs in late spring to early summer and lasts 1-2 weeks, after which the adult emerges by cutting a distinctive D-shaped exit hole in the bark (Fig. 1).



Figure 1. FHATB exit holes. *Photo by Frank Hale, Entomology and Plant Pathology, University of Tennessee*

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Damage Symptoms

The most serious injury to host plants is caused by larval feeding activity beneath the bark that damages the cambium layer and disrupts the flow of vital nutrients throughout the tree. A single larva is capable of girdling a young tree within one season. Evidence of larval activity can be found under bark of infested trees as sinuous feeding tunnels packed with frass (Fig. 2). Portions of the trunk may show signs of infestation by noticeable oozing of sap. Trees that survive borer attacks are often left scarred and unmarketable (Fig. 3).



Figure 2. Frass-filled galleries. *Photo by Nadeer Youssef, TSU Otis Floyd Nursery Research Station, McMinnville, TN*

By contrast, adult feeding activity typically causes little damage, though there have been reports of trees being completely defoliated by FHATB when beetle population densities are unusually high. Adult beetles can also gnaw on woody tissues in branch crotches, around bud scars and at the base of leaf petioles.



Figure 3. Tree scar from FHATB. *Photo by Frank Hale, Entomology and Plant Pathology, University of Tennessee*



Figure 4. Larva of FHATB. *Photo by Joshua Basham, TSU Otis Floyd Nursery Research Station, McMinnville, TN*

Identification

Legless larvae are readily recognized by their flattened, sclerotized (hardened) thoracic area, with the remainder of body segments having a slightly off-white color (Fig. 4)

Adult beetles are often described as “bullet-shaped” and are about 0.3–0.6 inches long, with large compound eyes. From above, the back of FHATB is ornamented with several irregular brassy spots (Fig. 5). Beneath the wings, the abdomen is a metallic purple, while the ventral surface is metallic bronze. Forelegs of male beetles are armed with several small teeth (Fig. 6). Antennae are a dark reddish color, 11-segmented, with the last segment tapering apically (Fig. 7).

The FHATB is part of a larger species complex in which all the members have a similar appearance (Fig. 5). In most cases, it is difficult to determine which species is

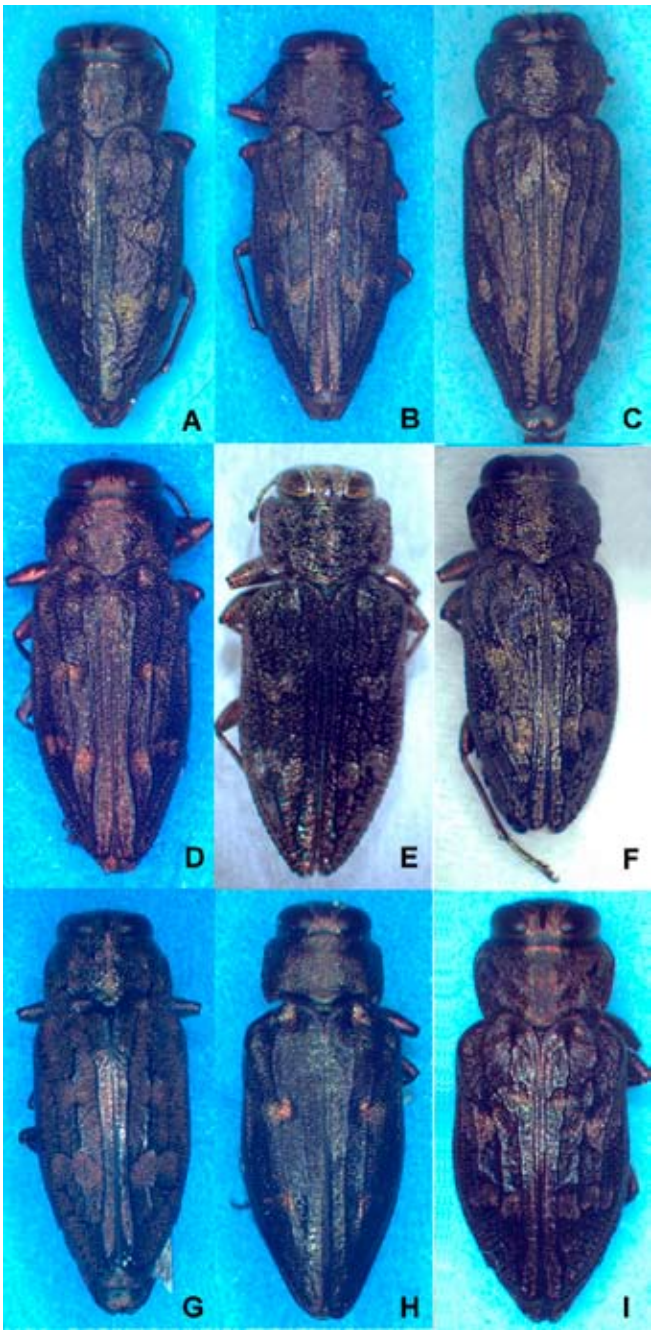


Figure 5. Chrysobothris femorata complex and others buprestids similar in appearance: A) C. femorata, B) C. adelpha, C) C. rugosiceps, D) C. viridiceps, E) C. quadriimpressa, F) C. shawnee, G) C. cribaria, H) C. sexsignata, and I) C. wintu (western U.S. species, not found in Tennessee). *Photos by Jason Hansen, University of Tennessee*

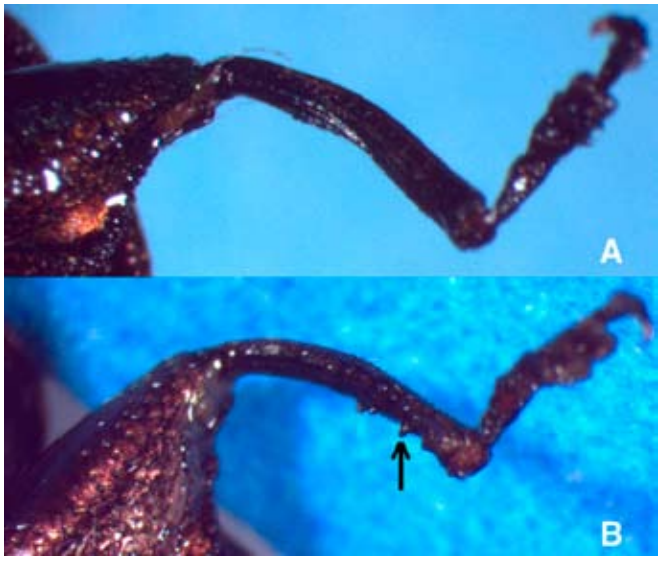


Figure 6. Male foreleg characteristics of select Chrysobothris species: A) C. sexsignata, with smooth foreleg and B) C. femorata, with spined teeth (arrow). *Photos by Jason Hansen, University of Tennessee*

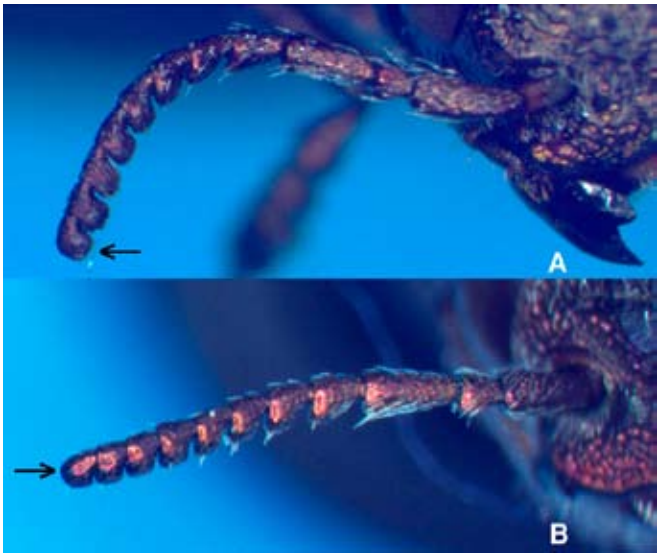


Figure 7. Antennal comparison of two species in the Chrysobothris femorata "species complex": A) Chrysobothris rugosiceps, with last antennal segment quadrate and B) C. femorata, with last antennal segment tapered. *Photos by Jason Hansen, University of Tennessee*

present in the field without closer microscopic examination. Some can be separated using characters on the face of the beetle (Fig. 8). There is some genetic evidence that interbreeding may be occurring between different species in this complex. Eight members of this group occur in the southeastern U.S. and it is still unclear which of them, in addition to FHATB, may be economic and aesthetic threats. Plant host range is known to overlap significantly within this group and correct identification is important before control strategies are implemented.

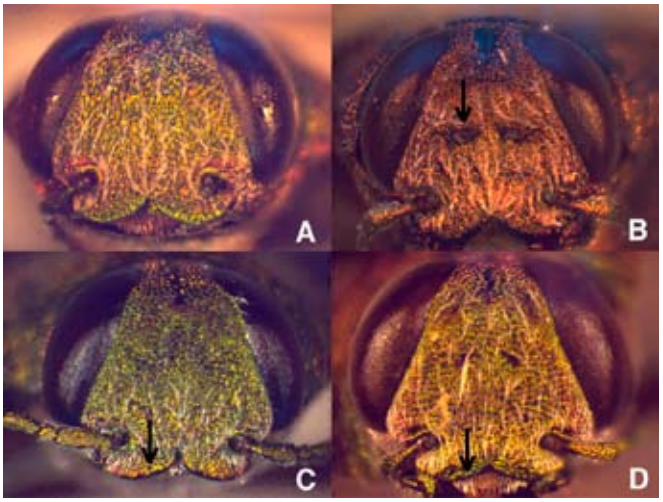


Figure 8. Face of four common species in the Chrysobothris femorata "species complex" with distinguishing characters indicated (arrows): A) Chrysobothris viridiceps male, B) C. rugosiceps male, with irregular purple spots, C) C. femorata male, with semicircular clypeus (compare with D) and deeply cut central notch, and D) C. adelpha male, with clypeus having a more straight angle, rather than semicircular (compare with C). *Photos by Jason Hansen, University of Tennessee*

Management Options

- Monitoring – populations of FHATB can be surveyed using purple panel traps (Fig. 9) covered with adhesive pastes (eg. Pestick® or Tanglefoot®) starting mid-April. This new trapping method attracts a wide range of buprestids, including many in the *Chrysobothris femorata* complex, and it is important to know which pest species is a problem when checking them (Figs. 5 & 10). If males are trapped, genitalia can easily be used to separate the six most common species in the southeastern U.S. (Fig. 11). Alternatively, trees can be inspected on an individual basis to determine presence of injury in early spring before emergence begins.

- Cultural control – Proper plant management and maintenance are extremely important, as borers prefer to attack stressed or dying trees, while tending to avoid vigorously growing specimens.

- Biological control – Natural predators can play a significant role in reducing infestations, by causing reductions of borer populations ranging from 7 to 58 percent, depending on environmental conditions. Though not commercially available, several species of wasps that have been reported to attack FHATB, including *Labena grallator* Say, *Cryptohelcostizus chrysobothridis* Cushman (Hymenoptera: Ichneumonidae); *Phasgonophora sulcata* Westwood (Hymenoptera: Chalicidae); *Eusandalum spp.* (Hymenoptera: Eupelmidae); *Heterospilus astigmus* Ash. and *Atanycolus rugosiventris* Ash. (Hymenoptera: Braconidae), may occur in Tennessee. Beetles from the clerid family (*Chariessa pilosa* Forst., *C. pilosa onusta* Say) as well as an asilid fly (*Andrenosoma fulvicauda* Say) have also been reared from FHATB.

- Chemical control – Several pesticides are available to treat for FHATB by drench treatments applied from February to mid-April that include imidicloprid (e.g., Merit 2F®, Merit 75WSP®, Bayer Advanced Tree & Shrub Insect Control® for ornamental uses in landscapes) used either alone or in addition to cyfluthrin (e.g., Discus® for use in commercial nurseries) or bifenthrin (e.g., Allectus SC® for ornamental uses in landscapes) or Allectus GC SC®, which is labeled for use on golf courses and sod farms. Adult beetles can be controlled by spraying tree trunks in mid-May and late June when borers are at peak emergence with permethrin (e.g, Astro® for ornamental uses in landscapes, Perm-Up 3.2 ® for use in commercial nurseries), bifenthrin (Onyx® for ornamental uses in landscapes, Onyx Pro® for use in commercial nurseries), or chlorpyrifos (Dursban 4E®, Dursban 50W® for use in commercial nurseries).

Related References & Additional Reading:

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Figure 9. A purple panel trap design, which was first developed by Jason Oliver and others at the Tennessee State University's Otis Floyd Nursery Research Station in McMinnville, TN. *Photo by Nadeer Youssef, TSU Otis Floyd Nursery Research Station, McMinnville, TN*

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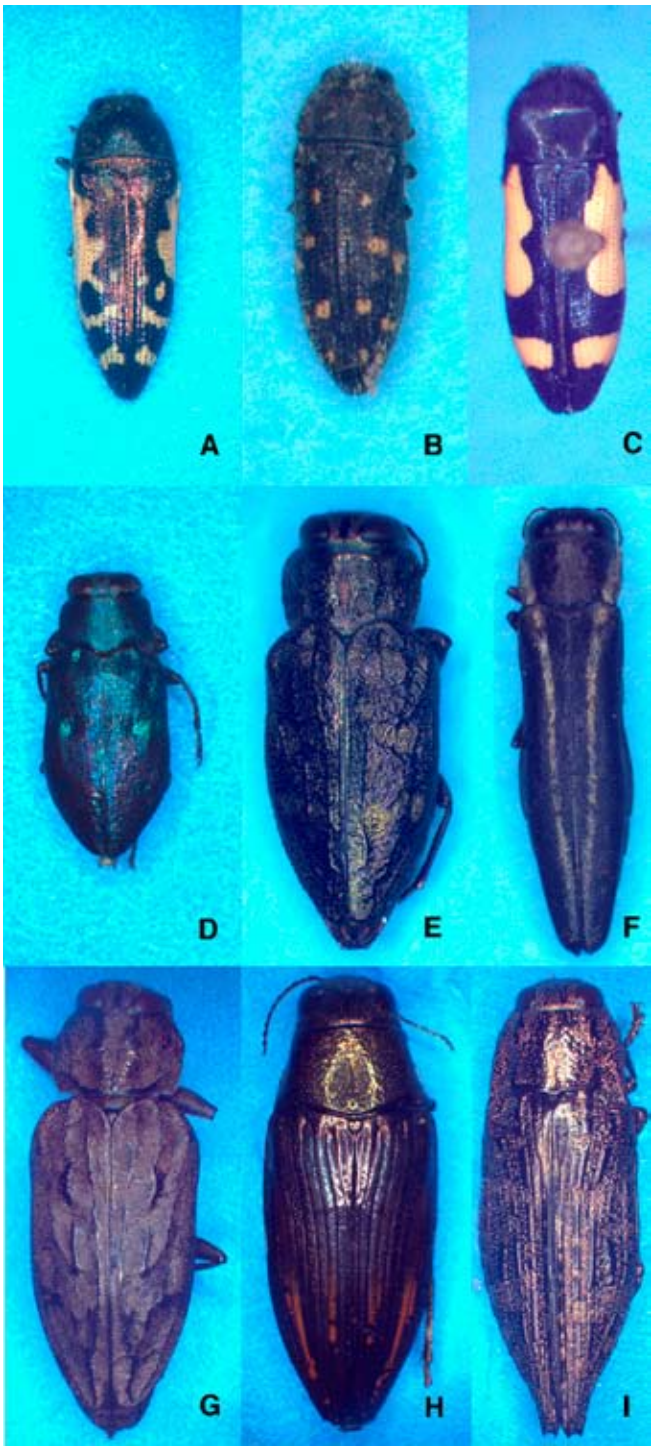


Figure 10. Common buprestids attracted to purple panel traps in Tennessee: A) Acmaeodera pulchella, B) A. tubulus, C) Ptosima gibbicollis, D) Chrysobothris azurea, E) C. femorata, F) Agrilus bilineatus, G) C. dentipes, H) Buprestis lineata, and I) Dicerca obscura. *Photos by Jason Hansen, University of Tennessee*

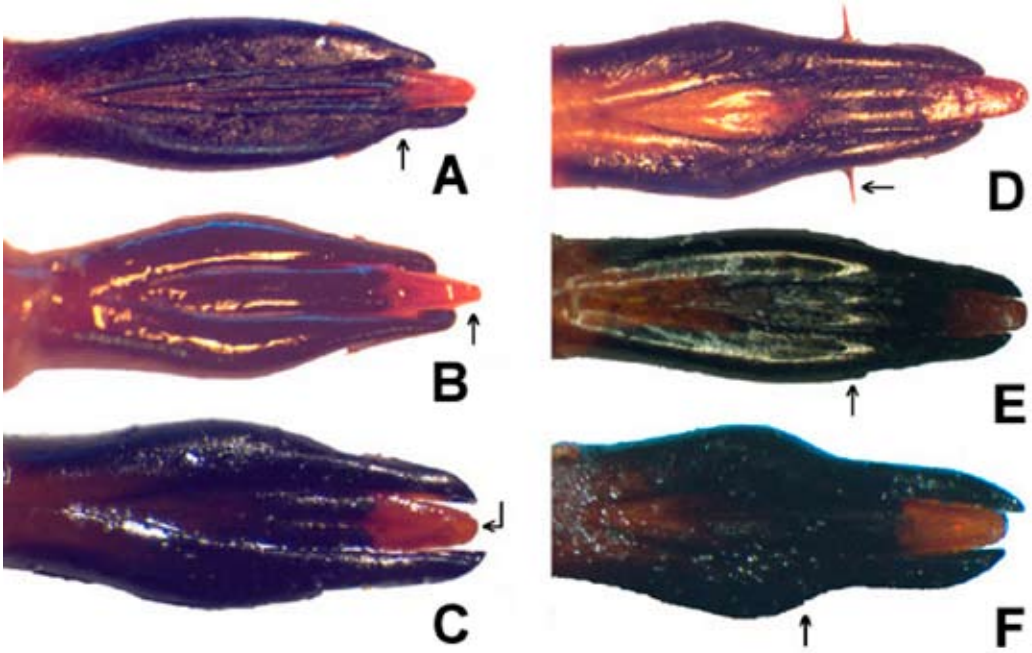


Figure 11. Genitalia charateristics of adult male Chrysobothris beetles are critical identification guides for differentiating species within the Chrysobothris femorata "species complex." Examples of species collected on purple panel traps in Tennessee include: A) Chrysobothris viridiceps, with constriction (arrow) near the apex of one lobe of the genitalia, B) C. rugosiceps. tip of aedeagus (arrow) slightly narrower than the tips on adjacent lobes, C) C. femorata, with the tip of aedeagus broad (arrow), D) C. adelpha, with spines (arrow) protruding perpendicularly to lateral lobes, E) C. shawnee, with narrow lateral lobes that gradually taper to the tip, and F) C. quadriimpressa, with lateral lobes constricted (arrow) behind strong lateral bulges. *Photos by Jason Hansen, University of Tennessee*

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label. Persons who do not obey the law will be subject to penalties.

Disclaimer Statement

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

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