COOPERATIVE EXTENSION
COLLEGE OF AGRICULTURE
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AMBROSIA BEETLES IMPORTANT TO TENNESSEE NURSERIES

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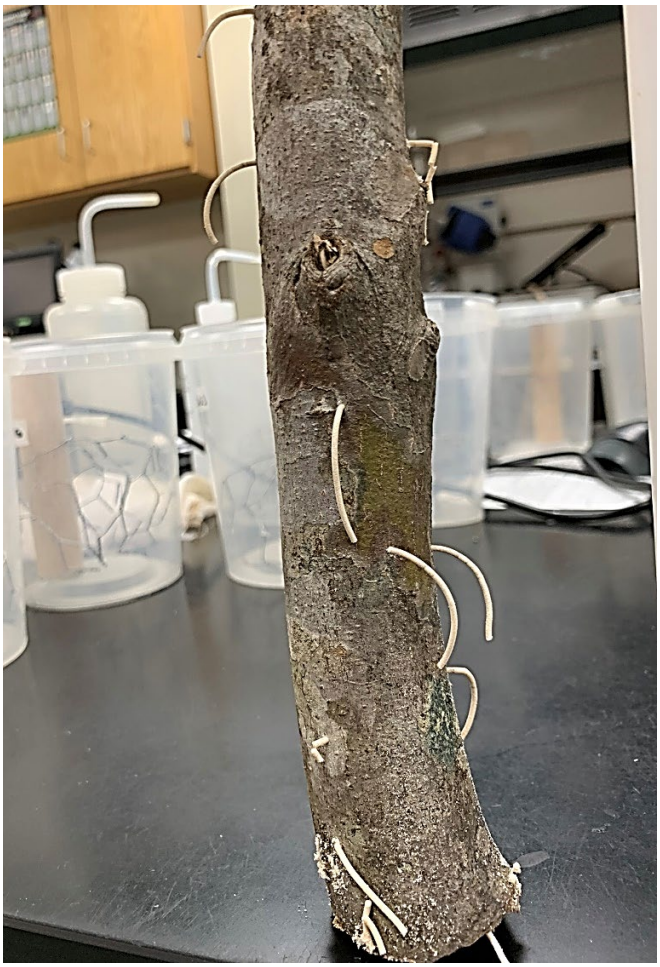
BACKGROUND

Ambrosia beetles, also known as fungus farming beetles, are one of the most damaging groups of insect pests in woody ornamental crops. Adult female ambrosia beetles bore into suitable host trees and create galleries (tunnels) in the vascular tissues of trees. Then, fungal spores are inoculated on the gallery walls. Once the fungal garden is flourishing, the adult female begins to lay eggs in the galleries. If the symbiotic fungus does not establish well, the female will die or abandon the tunnel, and colonization will be unsuccessful. Fungus is the main source of nutrition for both adult and larval beetles. Ambrosia beetles are haplo-diploid, with males developing from unfertilized, haploid eggs and females from diploid eggs. Females usually mate with sibling males before emerging from the natal gallery. Beetle attacks in Tennessee are most common in the spring when trees are breaking dormancy. The spring flight period of most nursery pest ambrosia beetles usually begins in April and is often synchronous with the blooming of redbud trees.



SYMPTOMS OF AMBROSIA BEETLE ATTACK

Attacks are not always obvious; they can sometimes be difficult to detect due to the small diameter of the entrance hole. The compacted chewed wood material excavated during the tunneling process creates toothpick-like extrusions projecting

1 to 1.5 in (4 cm) from the stems. The 'toothpicks' are one of the most characteristic signs of ambrosia beetle attack. Sap stains on the bark also may be a visible symptom primarily in spring and sometimes in late summer or early fall. Foliage wilting and branch dieback also are observed as symptoms of ambrosia beetle attack when branch or trunk tissues are girdled.

CHALLENGES

The major pest species of ambrosia beetles in woody ornamental nurseries can be challenging to identify due to their small size, homogeneous body shape, and dull coloration. At higher magnification, differences in the morphology of the head, abdominal declivity (hind end of abdomen), and micro sculpturing can differentiate important pest species. Four species of ambrosia beetles cause the most economic damage in Tennessee nursery and landscape trees (Figs. 1-4). Other species may be more prevalent in different states and agricultural or forest systems.

IMPORTANT AMBROSIA BEETLE PESTS OF NURSERY TREES IN TENNESSEE

Xylosandrus germanus (Blandford)

The black stem borer (*X. germanus*) is native to the Eastern Palearctic and East Asian regions and is now widely established in North America, Europe, and Oceania. Black stem borer was first reported as a pest on grapevine in 1932 on Long Island, New York. The beetle can attack more than 200 woody plant species and currently is found in 35 of 50 U.S. states.

An adult female black stem borer is a compact and hump-shaped shiny black beetle approximately 0.079 in (2 mm) in length with a hooded head, and its mouthparts directed downwards. The declivity has rows of punctures (striae) with hairs (setae) present only between the line of punctures. Males are generally smaller and lighter brown in coloration than females and unlike females, do not fly. The black stem borer species may be confused with similar looking invasive species such as *Anisandrus maiche* (Kurentzov) and *Anisandrus dispar* (Fabricius).

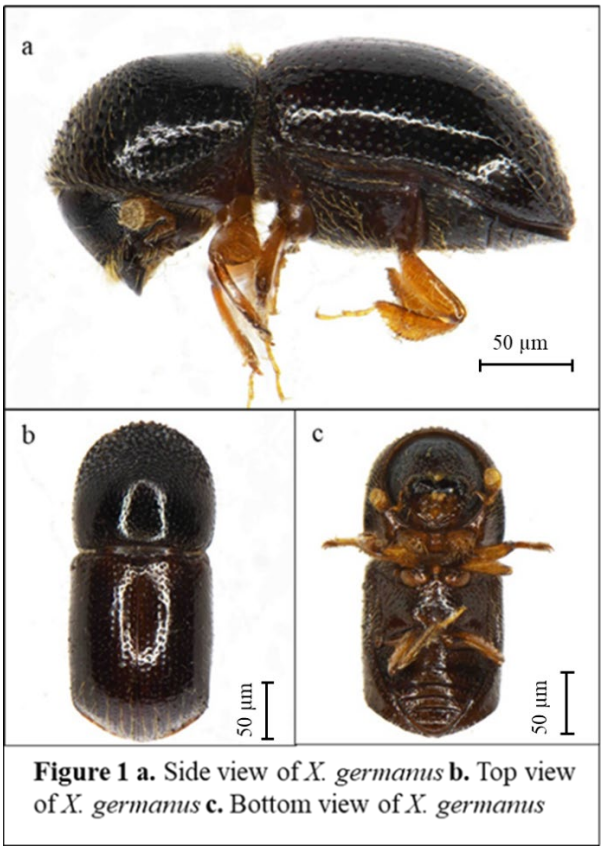


Figure 1 a. Side view of *X. germanus* **b.** Top view of *X. germanus* **c.** Bottom view of *X. germanus*

Xylosandrus crassiusculus (Motschulsky)

The granulate ambrosia beetle (*X. crassiusculus*) was first recorded in the continental United States in 1974 from dying sweetgum wood in Summerville, South Carolina. The beetle is reported to attack more than 120 plant species and is found in more than 29 states.

Adults are small with a reddish-brown appearance, but the outer wing (i.e., elytra) color can vary from reddish dark brown to black. Granulate ambrosia beetle has a “granulated” region located on the front portion of the downward facing head and setae (long hairs) on the back end of the elytra. The declivity surface is recognizable in being without punctures or raised ridges and having dull, dense, confused granules. Females are longer (0.079-0.098 in [2-2.5 mm]) than males (0.059 in [1.5 mm]). Females can fly, but males are flightless.

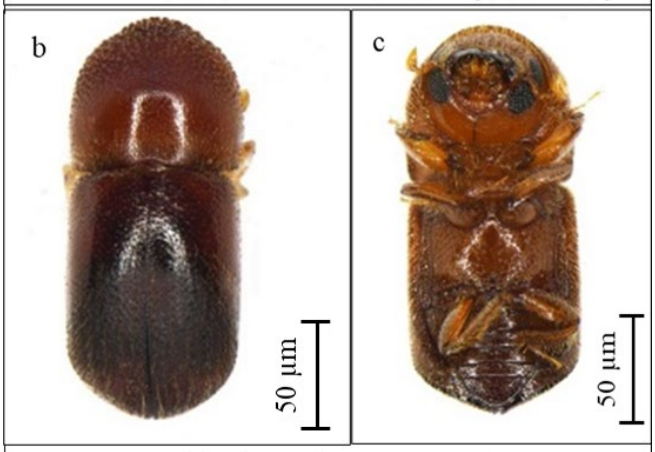
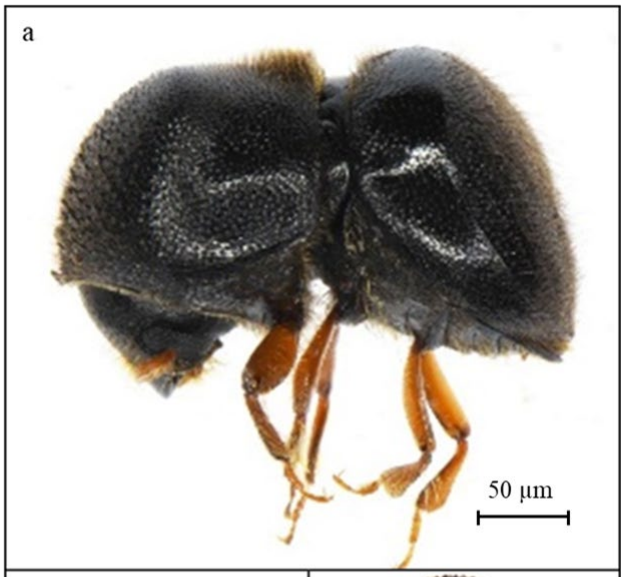


Figure 2 a. Side view of *X. crassiusculus* **b.** Top view of *X. crassiusculus* **c.** Bottom view of *X. crassiusculus*

Males are uncommon due to the female skewed sex ratio.

Cnestus mutilatus (Blandford)

The camphor shot borer (*C. mutilatus*) is native to Asia and was first reported in 1894 in Italy and in the United States in 1999 in Oktibbeha County, Mississippi. The camphor shot borer can be distinguished from other ambrosia beetles by its relatively large size (mean 0.146 in [3.7 mm]) and truncated elytra, which are shorter than the first thoracic segment (pronotum) (Fig. 3). Adult female camphor shot borers are approximately 0.102-0.157 in (2.6 to 4.0 mm) long, dark brown to black in appearance, and broadly oval when viewed from above. Adult males are similar in shape to females but are smaller in size. Their cylindrical body and the shape of the abdomen, which is shorter than the head and thorax and looks as if it were cut off at an angle or squished, are the distinguishing characteristics of this species.



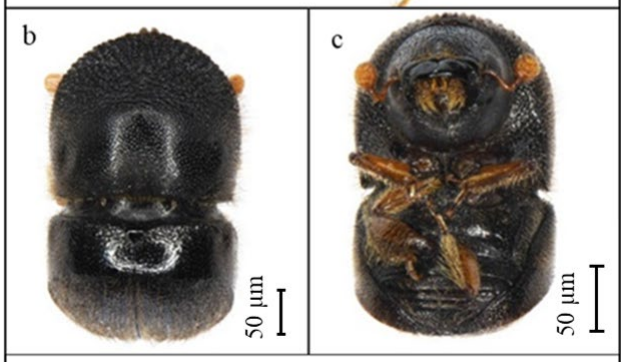


Figure 3 a. Side view of *C. mutilatus* **b.** Top view of *C. mutilatus* **c.** Bottom view of *C. mutilatus*

Xyleborinus saxesenii (Ratzeburg)

The fruit-tree pinhole borer (*X. saxesenii*) was one of the first non-native ambrosia beetles introduced to North America from Europe or Asia. This beetle was first detected in California in 1904 and is now widely distributed in the United States. The fruit-tree pinhole borer is one of the most abundant ambrosia beetles but is rarely damaging to nursery trees. However, the beetle has recently been found to spread laurel wilt-disease pathogen. Adult *X. saxesenii* are less than 0.079 in (2 mm) in length, elongate and cylindrical. The pronotum color ranges from light to dark brown, while the elytra range from dark brown to black (Fig. 4). The fruit-tree pinhole borer may be mistaken for another invasive ambrosia beetle, *Xyleborinus attenuatus* (Blandford).

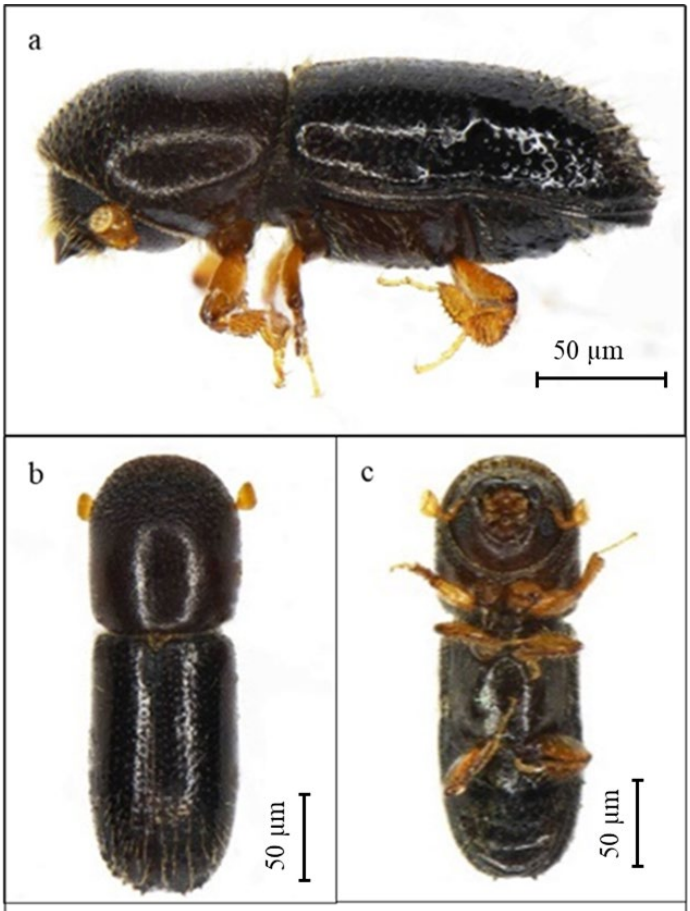


Figure 4 a. Side view of *X. saxesenii* **b.** bottom view of *X. saxesenii* **c.** Top view of *X. saxesenii*

MANAGEMENT

These four species of ambrosia beetles attack nursery trees that emit ethanol, which is produced in response to stress and anaerobic respiration. Attacks usually occur in the spring when trees are coming out of dormancy. Therefore, management for these beetles is focused on maintaining tree health, especially during the beetle flight period. Cultural controls include timely irrigation and avoiding flood conditions or saturated container media. Adequate fertilization rates to optimize tree health in the field and termination of fertilizers after July to allow proper tree dormancy are also important for avoiding attacks. Mechanical wounding of trees should be avoided as much as possible to prevent stressing the tree. Removing damaged branches quickly can be an effective way to prevent ambrosia beetle damage. Trees susceptible to frost damage or sunscald can be targets of ambrosia beetles. If trees have been exposed to these conditions, they can be protected by applications of pyrethroid insecticides (permethrin or bifenthrin). Repeat applications of insecticides at 2-to-3-week intervals (as permitted by insecticide labels) may be required to protect susceptible trees until the end of peak spring emergence.

Photo credits: Anju Poudel and Garrett Roper, Tennessee State University.

REFERENCES

Agnello, A.M., Breth, D.I., Tee, E.M., Cox, K.D., Villani, S.M., Ayer, K.M., Wallis A.E., Donahue D.J., Combs, D.B., Davis, A.E., Neal, J.A., & English-Loeb, F.M. (2017). *Xylosandrus germanus* (Coleoptera: Curculionidae: Scolytinae) occurrence, fungal associations, and management trials in New York apple orchards. *Journal of Economic Entomology*, *110*(5), 2149-2164.

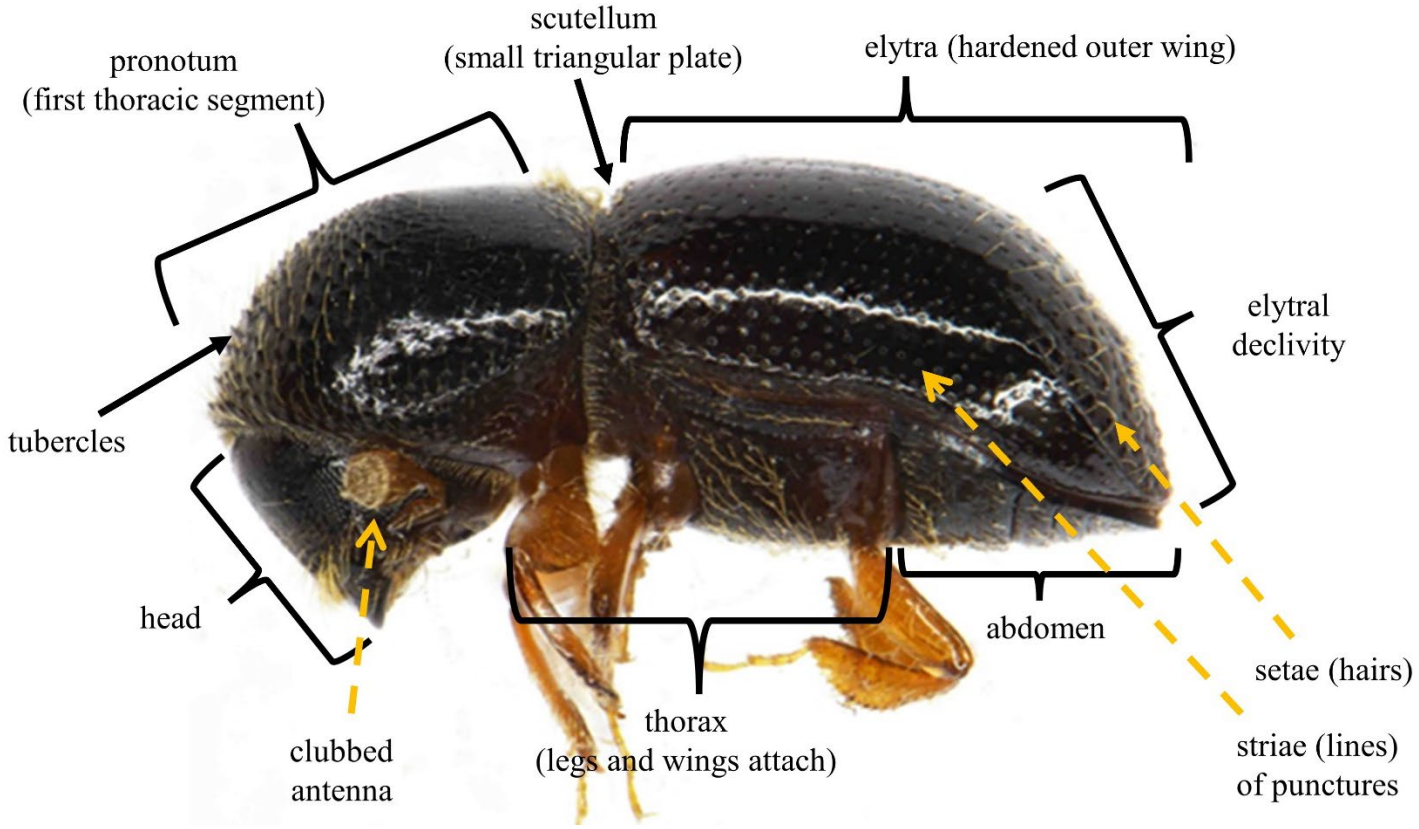
Colombari, F., Martinez-Sañudo, I., & Battisti, A. (2022). First report of the alien ambrosia beetle *Cnestus mutilatus* and further finding of *Anisandrus maiche* in the European part of the EPPO region (Coleoptera: Curculionidae: Scolytinae: Xyleborini). *EPPO Bulletin*.

Rabaglia, R. J., Dole, S. A., & Cognato, A. I. (2006). Review of American Xyleborina (Coleoptera: Curculionidae: Scolytinae) occurring north of Mexico, with an illustrated key. *Annals of the Entomological Society of America*, *99*(6), 1034-1056.

Ranger, C. M., Reding, M. E., Addesso, K., Ginzel, M., & Rassati, D. (2021). Semiochemical-mediated host selection by *Xylosandrus* spp. ambrosia beetles (Coleoptera: Curculionidae) attacking horticultural tree crops: a review of basic and applied science. *The Canadian Entomologist*, *153*(1), 103-120.

Ranger, C. M., Schultz, P. B., Frank, S. D., Chong, J. H., & Reding, M. E. (2015). Non-native ambrosia beetles as opportunistic exploiters of living but weakened trees. *PLoS One*, *10*(7), e0131496.

ANATOMY GUIDE



For additional information, contact your local nursery specialist at:

Tennessee State University, Otis L. Floyd Nursery Research Center
472 Cadillac Lane McMinnville, TN 37110
http://www.tnstate.edu/agriculture/nrc/
931-668-3023

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.

Disclaimer

This publication contains microbial 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 microbial pesticide being used. The label always takes precedence over the recommendations found in this publication. Use of trade, brand, or active ingredient names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar and suitable composition, nor does it guarantee or warrant the standard of the product. The author(s) and Tennessee State University assume no liability resulting from the use of these recommendations.