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The redbay ambrosia beetle, *Xyleborus glabratus* Eichhoff (Fig. 1) is an economically important pest native to India, Japan, and southeast Asia. The primary hosts of this species are trees in the laurel family (Lauracea) such as redbay (*Persia borbonia*), avocado (*P. americanum*) and Asian spicebush (*Lindera latifolia*). The beetles and their larvae cultivate and feed on the symbiotic fungus *Raffelea* sp. which causes laurel wilt disease and can kill healthy trees (Figs. 2-4).

*Xyleborus glabratus* is a member of the Curculionidae (subfamily Scolytinae) which is comprised of weevils and bark beetles. Members of this family are highly variable but almost all species share a distinct club on the end of their antennae consisting of three segments. The subfamily Scolytinae, to which *Xyleborus* belongs, consists of the bark beetles. In general, members of Scolytinae are small (<10mm long) pill shaped beetles of a reddish brown or black, or tan color. Some authors consider Scolytinae to be a distinct family (Scolytidae).

The tribe Xyleborini is a large and widespread group of genera of the Scolytinae. The tribe is most notable for having dwarfed haploid males which never leave the parental galleries (Fig. 5-6) and numerous small socketed spines on the tibia of females. The genus *Xyleborus* contains more than 500 species, seventeen of which are native to North America. The genus has a worldwide distribution, inhabiting every continent except Antarctica. The genus *Xyleborus* is distinguished by an obliquely truncate club, elongate pronotum, and flat scutellum. *Xyleborus glabratus* was detected in 2002 in Georgia and has since spread to South Carolina in 2004, Florida in 2009, and by 2011 in North Carolina, Alabama and possibly Mississippi. Non-targets often captured during *X. glabratus* surveys include other members of the genus such as *X. celsus*, *X. dispar*, and *X. ferrugineus*. A quality, high powered microscope is required to examine the characters necessary to identify these beetles.

This aid is designed to assist in the sorting and screening of *X. glabratus* suspect adults collected in CAPS Lindgren funnel traps in the continental United States. It covers basic Sorting of traps, First Level, and Second Level screening, all based on morphological characters. Basic knowledge of Coleoptera morphology is necessary to screen for *X. glabratus* suspects.



Fig. 1: *Xyleborus glabratus* on tree (photo by R. Scott Cameron, Advanced Forest Protection, Inc., Bugwood.org).



Fig. 2: *Xyleborus glabratus* galleries (photo by James Johnson, Georgia Forestry Commission, Bugwood.org).

# Sorting

## Redbay Ambrosia Beetle

*Xyleborus glabratus* Eichhoff

*Xyleborus glabratus* survey Lindgren funnel traps should be sorted initially for the presence of beetles of the appropriate size color and shape.

1. Beetles are between 2 mm (0.1 inches) and 3 mm (0.2 inches) in length.
2. Beetles are pill-like in shape.
3. Beetles are black, reddish-brown, or tan colored.

Beetles meeting these requirements should be forwarded to Level 1 Screening (Page 3).



Fig. 3 and 4: Redbay trees killed by laurel wilt. This disease is caused by the fungus *Raffaelea* sp. which is spread and cultivated by *X. glabratus*. After the introduction and spread of *X. glabratus* through The Southeastern United States, laurel wilt decimated the areas redbay populations with some areas seeing 90% mortality (photos by Albert (Bud) Mayfield, USDA Forest Service, Bugwood.org).



Fig. 5 and 6: Male (top) and female (bottom) *Xyleborus* sp. All members of the tribe Xyleborini show strong sexual dimorphism with haploid, wingless males that never leave the parental gallery. Females need not mate to produce male offspring and will mate with their own sons. This reproductive strategy allows the beetles to rapidly colonize any suitable area and accounts for the large number of species within the genus (photos by. Maja Jurc, University of Ljubljana, Bugwood.org).

# Level 1 Screening

## Redbay Ambrosia Beetle *Xyleborus glabratus* Eichhoff

Suspect adults should be pointed and properly labeled. Level 1 Screening is based on characteristics of the antennae, general dorsal surface, and tibia. It is designed to separate *Xyleborus* from related genera such as *Ips* (Figs. 9-10). Specimens with these traits should be forwarded to Level 2 Screening.

### Antennae

Scolytids have relatively stout, geniculate, clubbed antennae. The clubs are made up of three antennomeres and can be solid, annulated, or occasionally lamellate. The scape will always be well developed (Fig. 6). In *Xyleborus* the antennae have five segmented funicles and obliquely truncate clubs.



Fig. 6: Antenna of *Xyleborus* spp. Note the long scape and large three part club.

### General Dorsal Surface

Beetles in the tribe Xyleborini have the basal margins of their elytra unarmed and forming a straight line across the body (Fig. 7). The scutellum of tribe members is usually large and flat and the head is usually concealed at least partially by an enlarged pronotum.



Fig. 7: Base of elytra and scutellum of *Xyleborus* spp. Members of the Scolytinae have a broad scutellum and the base of the elytra is unarmed.

### Tibia

The mesothoracic and metathoracic tibia of *Xyleborus* are armed by a series of small teeth on the lateral apical angle (Fig. 8).



Fig. 8: *Xyleborus* spp. metathoracic tibia Note the row of small spines on the lateral apical angle (circled).



Figs. 9 and 10 (left): comparison of *Xyleborus glabratus* (far left) and *Ips* spp. (left). Though superficially similar, the Xyleborini and Ipini tribes can be differentiated by the excavated and spined declivity in *Ips*.

# Level 2 Screening

## Redbay Ambrosia Beetle *Xyleborus glabratus* Eichhoff

Level 2 screening is designed to separate suspect *X. glabratus* (Fig. 15) from other members of *Xyleborus* (Figs. 16-20). Screening is based mostly on general features and the elytral declivity. There are a number of remarkably similar species in this genus, so care should be taken in screening at this level.

### General Features

*Xyleborus glabratus* is a relatively slender species with a length to width ratio of 2.6 or greater (Fig. 15). *Xyleborus sayi* and some other species are more stout (Fig. 18) and are significantly larger than *X. glabratus*, with lengths of around 3-4 mm compared to the 1-2 mm of *X. glabratus*.

### Elytral Declivity

The elytral declivity of *X. glabratus* (Figs 21-22) is abruptly flattened or sometimes weakly convex. In addition the declivity bears a weak but distinct carinate ridge on the lower portion of the lateral margin (circled in Fig. 13) not found in native *Xyleborus* (Fig. 14). The declivity itself is armed with two distinct tubercles in the middle of the first and third interstriae (Figs. 11-12). The declivities of native *Xyleborus* species (Figs. 23-28) are strongly convex or excavated, lack a distinct carina on the lower lateral margin, and have different arrangements of tubercles. Because of the difficulty in identifying these traits, any *Xyleborus* with one or more of the features described above should be considered a viable *X. glabratus* suspect.



Figs. 11-12: Postrolateral and lateral views of the declivity of *X. glabratus*. Note the two small tubercles on the first and third interstria (circled).



Figs. 13 and 14: Lateral views of *X. glabratus* (left) and *X. pubescens* (right). Note the carina on the lower lateral margin of the *X. glabratus* declivity (circled).



Fig. 15: *Xyleborus glabratus* (target)



Fig. 16: *Xyleborus celsus*



Fig. 17: *Xyleborus xylographus*



Fig. 18: *Xyleborus sayi*



Fig. 19: *Xyleborus pubescens*



Fig. 20: *Xyleborus ferrugineus*



Fig. 21: *Xyleborus glabratus* declivity, posterolateral view (target).



Fig. 22: *Xyleborus glabratus* declivity, lateral view (target).



Fig. 23: *Xyleborus celsus* declivity, posterolateral view.



Fig. 24: *Xyleborus celsus* declivity, lateral view.



Fig. 25: *Xyleborus xylegraphus* declivity, posterolateral view.



Fig. 26: *Xyleborus ferrugineus* declivity, posterolateral view.



Fig. 27: *Xyleborus sayi* declivity, posterolateral view.



Fig. 28: *Xyleborus pubescens* declivity, posterolateral view.

Suspect *X. glabratus* specimens (scolytids with unarmed elytral bases, meso and metatibia armed with small spines, obliquely truncate antennae, and flattened or weakly convex declivities armed a carina on the lower lateral margin and tubercles on the first and third interstria) should be sent forward for identification. Specimens must be labeled and carefully packed to avoid damage during shipping.

## Key to Sort and Screen *X. glabratus* Suspects in the United States

1. Beetles approximately 1-2 mm long; pill shaped and with black, brown, or tan coloration..... 2
- 1'. Beetles larger than long; not pill shaped; or color not a shade of black, brown, or tan.....Not *X. glabratus*
2. Antennae geniculate with a large, obliquely truncate club made up of three segments (Fig. 6); basal margins of elytra unarmed and forming a straight transverse line across the body (Fig. 7); scutellum large and flat; head usually covered by pronotum; meso and metatibia armed with a series of small teeth (Fig. 8) ..... 3
- 2'. Antennae not geniculate or without a large obliquely truncate club made up of three segments; or basal margins of elytra armed with ridge or strongly procurved; scutellum small or absent; head may or may not be covered by pronotum; or meso and metatibia unarmed. ....Not *X. glabratus*
3. Body 2.6 times as long as wide (Fig. 15); declivity abruptly flattened or weakly convex (Figs. 21-22); carina on lower lateral margin of declivity or small tubercles on first and third interstria (Figs. 11-12)..... ***X. glabratus* suspect**
- 3'. Body stout (Fig. 18); or declivity excavated or strongly convex (Figs. 23-28) and without carina on lower lateral margin; tubercles variable but not solely on first and third interstria ....Not *X. glabratus*

## Citation

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## References for more information on *Xyleborus glabratus* and non-targets

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