

# An Ambrosia Beetle *Xyleborus affinis* Eichhoff (1868) (Insecta: Coleoptera: Curculionidae: Scolytinae)<sup>1</sup>

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## Introduction

*Xyleborus affinis* is one of the most widespread and common ambrosia beetles in the world. It is also very common in Florida. Due to its natural attraction to freshly dead wood, the species can be a structural pest of moist timber before the wood is treated. It is also commonly assumed to be the source of tree death because of its abundance in dead or dying trees, but confirmed records of *Xyleborus affinis* attacking healthy trees are rare. Even in the cases where damage on healthy trees is reported, it is quite likely that the trees have been under some prior unapparent stress, such as recent excess of water.

Like other ambrosia beetles, *Xyleborus affinis* bores tunnels (called galleries) into the xylem of weakened, cut or injured trees where a symbiotic fungus is farmed for food. Females lay eggs in the fungus-lined galleries and larvae feed exclusively on the fungi.

The gardens of *Xyleborus affinis* usually contain multiple fungus species (Kostovcik et al. 2015). Recent studies have shown that *Xyleborus affinis* can vector the fungus responsible for laurel wilt disease, *Raffaelea lauricola* T.C. Harr., Fraedrich & Aghayeva. Laurel wilt is a lethal disease of numerous species of trees in the Lauraceae family (Harrington and Fraedrich 2010; Harrington et al. 2010; Carrillo et al. 2013). In a study conducted by Carrillo et al. (2013),

*Xyleborus affinis* carrying *Raffaelea lauricola* was shown to attack both redbay and avocado trees, but only transmitted laurel wilt to redbay. Because of this, *Xyleborus affinis* may become a more serious pest where pathogenic ambrosia fungi are a concern.

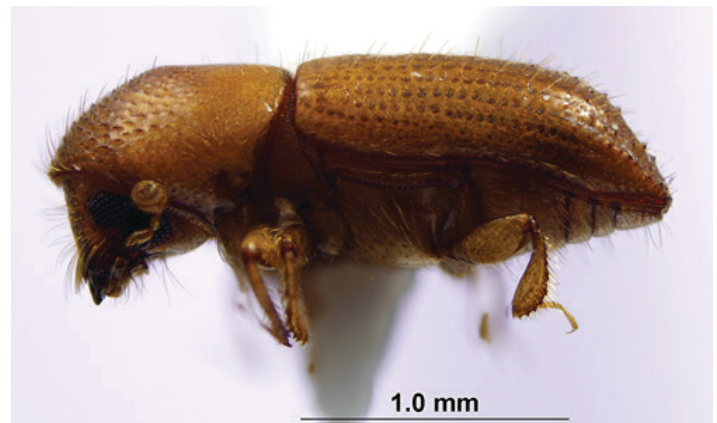


Figure 1. Adult female *Xyleborus affinis*.

Credits: Jiri Hulcr, UF/IFAS

## Distribution

*Xyleborus affinis* is native to the tropical and subtropical regions of the Americas, including Florida (Rabaglia et al. 2006; Atkinson 2014), and has recently spread to most tropical and subtropical regions in the world. Like many other wood borers, *Xyleborus affinis* can be easily spread through the distribution of wood in international commerce. Although it is among the most widespread and

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common ambrosia beetles in forested areas around the world, it is often under-reported because it is only weakly attracted to ethanol, the most commonly used lure for ambrosia beetle monitoring (Steininger et al. 2015).

In the US, *Xyleborus affinis* is distributed from the east coast of the United States, from Michigan in the north, south to Florida and as far west as Texas. It is also native to South and Central America, including the Antilles, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and Argentina. The beetle was introduced into Africa, Asia, Australia, Europe, and the Pacific Islands including Hawaii (Wood 1982; Rabaglia et al. 2006).

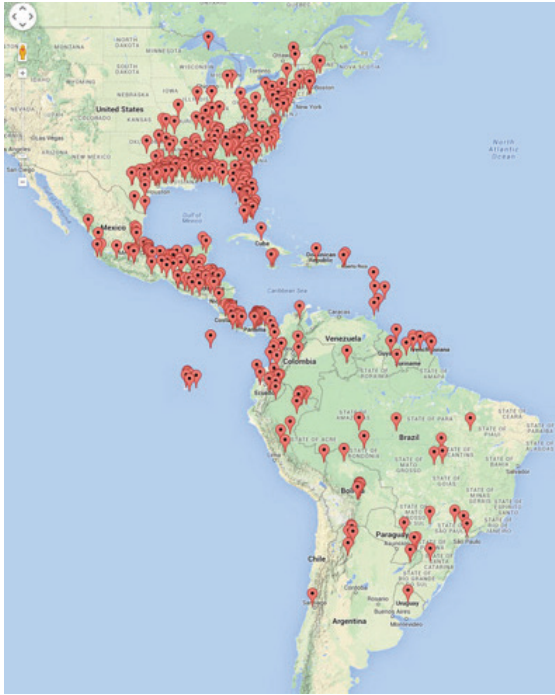


Figure 2. Current distribution of *Xyleborus affinis* in the New World as of November 2014. The species is also distributed around the world in all warm and humid regions, but that is not shown on this map. Credits: Atkinson (2014)

## Description

### Adults

This yellowish to reddish-brown species is similar in appearance to other ambrosia beetles in the genus *Xyleborus*. Most *Xyleborus* beetles have an elongated, cylindrical body and are yellow, red or light brown in color. Adults of all *Xyleborus* species are sexually dimorphic, with females being larger than males. *Xyleborus affinis* females average 2.0–2.7 mm and males are 1.7–2.0 mm in length (Wood 1962; Bright 1968). Males are wingless, have smaller eyes and antennae, and occur in much smaller numbers. The female:male sex ratio has been reported as 8.5:1 in one study (Roeper et al. 1980), but it varies significantly.

This species is very similar to two common *Xyleborus* species in Florida, *Xyleborus perforans* Wollaston and *Xyleborus volvulus* Fabricius. The only reliable way to distinguish *Xyleborus affinis* from these two is the abdominal declivity, the broad, downward slope at the end of the elytra. In *Xyleborus affinis*, the surface of the declivity is dull and opaque, in the other two species it is glossy and smooth. More information on identification of Florida's ambrosia beetles can be found here: <http://edis.ifas.ufl.edu/fr389>.

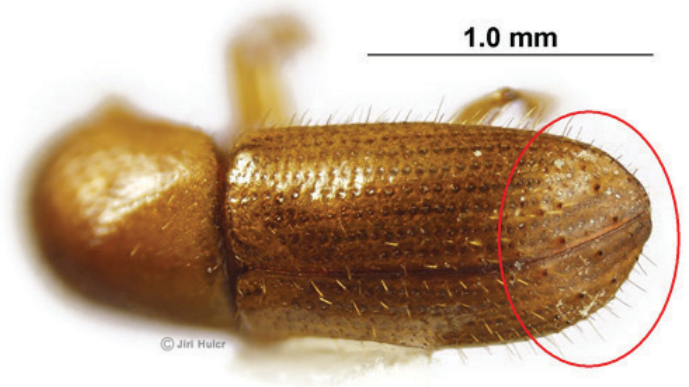


Figure 3. The opaque end of elytra in *Xyleborus affinis* Eichhoff. Note that the rest of elytral surface is glossy and smooth.

Credits: Jiri Hulcr, UF/IFAS

### Eggs

The off-white, oblong, glossy eggs range in length from 0.6 to 1.0 mm, averaging 0.718 mm. Eggs are laid in groups of two to four along the horizontal tunnels branching away from the main vertical tunnels. In temperatures of 29°C, females have been shown to lay eggs as soon as three days after introduction into the host and up to 27 days (Roeper et al. 1980). One female can lay several dozen eggs, but the number of eggs (and hence larvae) in an individual gallery can be greater because daughters often lay eggs there as well.

### Larvae

Larvae are white, legless, and slightly curved. Larvae hatch in 7–14 days at 29°C and in 14–35 days at 22–24°C. They feed exclusively on the farmed fungal symbiont that lines the galleries. There are three larval instars (Roeper et al. 1980).

### Pupae

The initially white pupae turn light brown just before adult emergence and average 2.0 and 2.7 mm in length for male and female pupae, respectively. Larvae pupate for 11–23 days at 29°C and 21–35 days at 22–24°C. Adults emerge in 18–35 days at 29°C and 27–35 days at 22–24°C (Roeper et al. 1980).



## Biology and Ecology

*Xyleborus affinis* is naturally found in moist, fallen logs on the ground of natural forests and rarely interferes with human activities. In large trees, the beetles colonize dead phloem first, followed by the xylem, where the majority of eggs are laid (Jiri Hulcr, unpublished data). The females inoculate the interior of the tunnels they create with the fungal symbiont, which is stored in a specialized pouch called the mycangium inside the beetle's mouth. Larvae feed on the fruiting bodies of the fungi until adulthood (Carrillo et al. 2013).



Figure 4. Fallen log with frass and bore holes of *Xyleborus affinis* at Lumber River State Park, NC, July 2010.  
Credits: Jiri Hulcr, UF/IFAS

As in all other ambrosia beetles in the tribe Xyleborini, *Xyleborus affinis* is haplo-diploid and inbred. This means that females hatch from fertilized eggs with both the mother's and the father's genetic information. Males, on the other hand, only inherit their mother's genes—they never have a father. Males never leave the original host tree, and their only role in life is to fertilize the females around them, typically their sisters. Females, upon reaching adulthood, either keep reproducing in the same log if conditions permit, or fly out in search of a new host if their native log is too deteriorated (Wood 1982). The ability of *Xyleborus affinis* to maintain overlapping populations in the same log is unusual among ambrosia beetles because in most species each generation seeks a new host.

*Xyleborus affinis* can live in mutualistic symbiosis with several fungal species, typically in the genus *Raffaelea* (Kostovcik et al. 2015). As the symbiotic fungus community is diverse and not very specific, the beetle is able to acquire other fungal symbionts from other ambrosia beetles. An example is the recent acquisition of *Raffaelea lauricola*, a non-native pathogenic ambrosia fungus with which *Xyleborus affinis* did not coevolve (Carrillo et al. 2013).



Figure 5. Mycangia (fungus pockets) of the ambrosia beetle *Xyleborus affinis* in a cross-section of the beetle head.  
Credits: Jiri Hulcr and Kyle Miller, UF/IFAS

## Hosts

*Xyleborus affinis* is extremely polyphagous and has a known host range of 248 species, angiosperms as well as gymnosperms (Schedl 1962; Wood 1982).

While *Xyleborus affinis* is a generalist in terms of host tree, it is very selective in terms of host decay status and moisture: it preferentially colonizes larger and very moist pieces of wood that died recently. This species can reach especially high abundance in logs partially submerged in water or lying on moist ground. This is presumably to meet the moisture requirement of the symbiotic fungus.



Figure 6. *Xyleborus affinis* tunnels under bark—an unusual habit for ambrosia beetles, but common in this species. The tunnels contain adults and larvae.  
Credits: Jiri Hulcr, UF/IFAS (taken in Peru)

## Damage

The presence of *Xyleborus affinis* can hasten the decline of weak and injured trees, but normally does not cause it. Reports of this species attacking apparently healthy sugarcane and Lauraceae trees exist (Merkl and Tusnadi 1992; Granda Giro 2003; Wood 1982; Carrillo et al. 2013), but as with many ambrosia beetle damage reports, the actual health status of the trees had not been assessed.

Even though this is not an aggressive ambrosia beetle, it has recently become important from the phytosanitary perspective. This is due to the capacity of this species to vector pathogenic ambrosia fungi such as the causal agent of laurel wilt. Thus the spread of *Xyleborus affinis* from areas infected by this fungus may result in the transport of the pathogen to yet-uninfested regions.

*Xyleborus affinis* can cause structural damage to timber that is freshly cut (green timber) and has not been dried or chemically treated. Tunneling systems are found throughout the sapwood of the tree, but rarely in the heartwood. Depending on moisture conditions, trees could have numerous superficial tunnels that can be viewed upon pulling back the bark and many tunnels inside the xylem that become apparent when the wood is cut. *Xyleborus affinis* can cause greater timber damage than some other ambrosia beetles because of its family organization and labor division. While in most ambrosia beetles the gallery is excavated solely by the mother beetle, in *Xyleborus affinis* the daughter females help expand the tunnel system.

## Management

Typically no active management of *Xyleborus affinis* is necessary, as the beetle attacks dying or dead trees. However, it can be considered a pest in two circumstances: 1) as a secondary vector of *Raffaelea lauricola* in avocado groves, and 2) as a structural pest in green wood (non-treated, non-dried, broadleaf species), which is a rather rare event.

Good sanitation and immediate removal of trees showing signs and symptoms of laurel wilt and the use of dried wood for structural purposes is recommended.

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