Discovery of Redbay Ambrosia Beetle And Laurel Wilt Disease in Mississippi

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Abstract

In July of 2009, a new infestation of redbay ambrosia beetle (*Xyleborus glabratus*) and laurel wilt disease (*Raffaelea lauricola*) was discovered in Jackson County, Mississippi. This infestation is over 300 miles from the nearest confirmed infestation along the Atlantic coast. Preliminary funnel trap data and condition of symptomatic trees indicate the infestation in Mississippi began two or more years before detection.

Introduction and Distribution

- Laurel wilt is a deadly disease of redbay (*Persea borbonia*) (Fig. 1) and other species in the Lauraceae
- Native to Asia (India, Bangladesh, Japan, Taiwan)
- Discovered near Savannah, GA in 2004 (Fig. 2)
- Spreading at about 15-20 miles/year in GA, SC, and FL
- No known infestations in western GA, FL panhandle, or Alabama
- **Found in Jackson County, MS: July, 2009 (Fig. 2)**
- Males are flightless, but females are highly attracted to redbay trees, which can be killed after inoculation by a single beetle (See disease cycle, Fig. 3)

Causative Agents

- *Xyleborus glabratus,* non-native insect vector (Fig. 1A)
- *Raffaelea lauricola*, newly described exotic fungus

Other Hosts

- Sassafras (*Sassafras albidum*), distributed throughout the eastern U.S.
- Pondberry (*Lindera melissifolia*), a federally-listed endangered species (Fig. 4A)
- Pondspice (*Litsea aestivalis*), a state-listed endangered species

Figure 4: Other threatened species include the endangered Pondberry (A) and invertebrates such as the *Palamedes* Swallowtail butterfly (B).

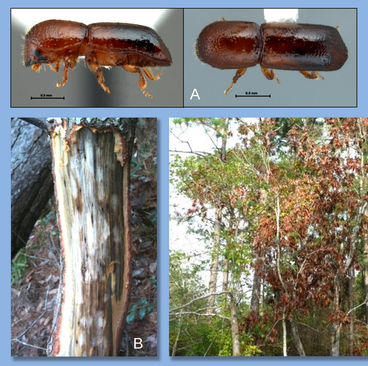

Figure 1: Once attacked by the redbay ambrosia beetle (A), inoculated redbay trees quickly exhibit characteristic wilted foliage (B) and vascular streaking (C) caused by the pathogen it carries.

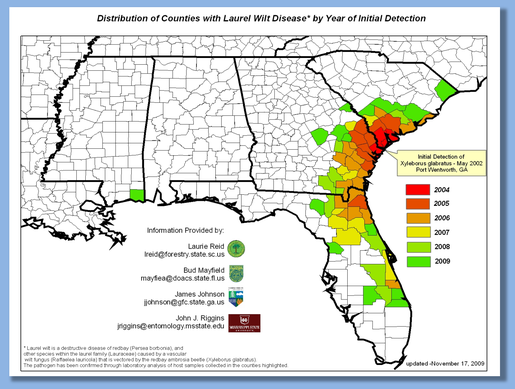

Figure 2: Counties with laurel wilt infestations by year of initial detection.

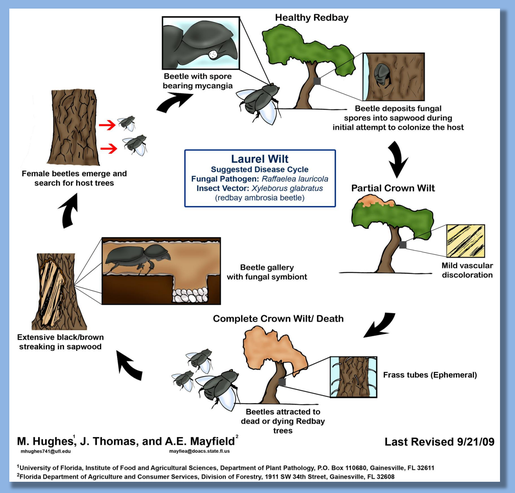

Figure 3: Laurel wilt disease cycle.

Monitoring and Detection

26 Lindgren funnel traps baited with Phoebe and Manuka oils were installed in the six southeastern-most counties of Mississippi and monitored bi-weekly from July-November, 2009 (Fig. 5). *X. glabratus* was collected 24 hours after the first trap was placed. Beetle ID was confirmed through USDA APHIS channels. Symptomatic redbay wood chips from the same location were surface sterilized and plated on cycloheximide-streptomycin malt agar and *R. lauricola* was isolated. A 1,026 BP portion of 18S rDNA (GenBank Accession No. GQ996063) was amplified by PCR and sequenced using primers NS1 and NS4. BLASTn searches revealed perfect homology to *R. lauricola* isolate PL 697 (GenBank Accession No. GQ329704). Two of the *R. lauricola* isolates recovered were each inoculated into two healthy redbays and placed into a growth chamber along with a water-only control. All inoculated plants, and none of the controls, exhibited wilt symptoms and died. *R. lauricola* was recovered from the discolored sapwood of the inoculated plants, completing Koch's postulates.

Discussion and Implications

- Origin in Mississippi is still unknown
- The current extent of the MS infestation is in and adjacent to the intersection of the Pascagoula river and I-10 (Fig. 5)
- Trap catches indicate slightly later peak emergence in MS than on average in the Atlantic population (Figure 6)
- Trap catch densities suggest that the MS infestation began 2-3 years ago (Table 1)
- Jeopardizes traditional Cajun cuisine, as redbay and sassafras leaves (Filé powder) are traditional ingredients
- Potential for spread throughout the U.S. in sassafras
- Fruits of redbay, pondspice, and pondberry are important food for wildlife including songbirds
- Cascading effects: *Palamedes* swallowtail butterfly larvae depend on *Persea* foliage for food

Future Work

- Forest Change detection to discover point of introduction
- Phylogeographic analysis of *X. glabratus* to determine method of introduction

Acknowledgements

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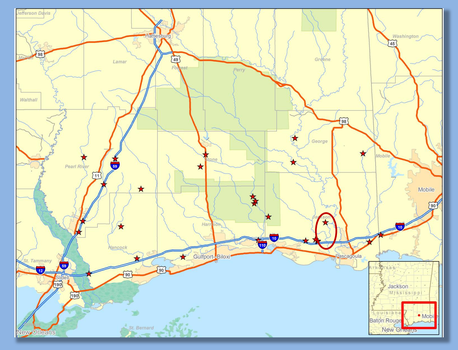

Figure 5: Redbay ambrosia beetle funnel traps in Mississippi during 2009. Current extent of known infestation is circled.

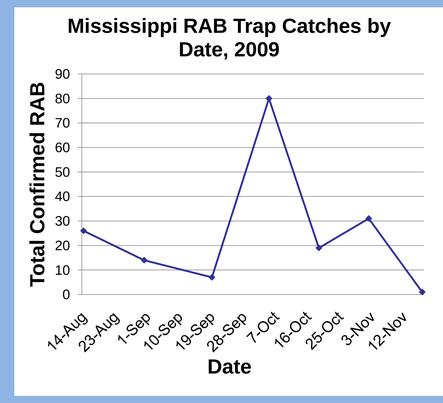

Figure 6: Number of confirmed *x. glabratus* captured in Mississippi during 2009.

	East Coast "Old Infestation"	East Coast "New Infestation"	Mississippi
#Beetles/trap /day	0.04-0.12	4-7	0.02-1.22

Table 1: Average number of beetles caught per trap per day in Mississippi is reminiscent of those reported in older infestations in GA and SC.

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