A survey for *Sirex noctilio* and native wood wasps in Alabama

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Introduction

Sirex noctilio has the potential to be a devastating economic pest in pine forests of the Southeastern United States. This invasive species has invaded commercial pine forests internationally, outside of its native range. The wasp causes damage to trees by oviposting eggs within the xylem of the tree, where eggs develop into larvae that bore and form galleries. A symbiotic fungus, *Amylostereum areolatum*, along with a phytotoxic venom causes the wood to rot, so the developing larvae have a substrate to feed upon (Fig.1C). The toxic venom causes wilting foliage and crown dieback (Edmonds et al., 2011).

Siricids in North America

- In North America, 23 species of siricid wood wasps have been recorded, including introduced species (Schiff et al., 2006).
- *Sirex noctilio* is currently is found in the New England states of New York, Pennsylvania, Vermont, Connecticut, Michigan, and in the Canadian province of Ontario.

Deladenus siricidicola and the *Sirex* Wasp

- Nematodes (Fig. 1 B) naturally found in the abdomen the wasps, and cause sterilization of the eggs inside a female's abdomen (van der Nest et al., 2012)
- Some populations have proven to be more virulent than others, capable of completely sterilizing infected wasps (Slippers et al., 2012)

Amylostereum areolatum and the *Sirex* Wasp

- Obligate mutualistic relationship, provides food for larval wasps (Fig .1 C)
- Fungal spores are carried by the wasp in an organ called a mycangum (Fig. 3) that is found internally at the base of the ovipositor (Edmonds et al., 2011)
- As a pathogen by itself is not damaging enough to cause tree mortality as with other basidiomycetes
- Restricts water flow in the vascular system of the infected tree by degrading tissues into a white rot (van der Nest et al., 2012)

Objectives

- To identify native and invasive woodwasps in Alabama Forests
- To use molecular techniques for species identification of wood wasps, fungi, and nematodes
- To determine which species of fungi and nematodes are associated with woodwasps in Alabama

Literature Cited

- Edmonds, R.L., Agee, J.K., Gara, R. I. (2011) Forest Health and Protection, Waveland Press, Inc.
- Schiff, N.M., Valley, S.A., LaBonte, J.R., Smith, D.R. (2006). Guide to the Siricid Woodwasps of North America, USDA Forest Service Forest Health Technology Enterprise Team.
- Slippers, B., Hurley, B.P., Mlonyeni, O., de Groot, P., Wingfield, M. J. (2012) Factors Affecting the Efficacy of *Deladenus siricidicola* in Biological Control Systems. The Sirex Woodwasp and its Fungal Symbiont: Research and Management of a Worldwide Invasive Pest, Springer Press.
- van der Nest, M. A., Wingfield, B. D., Wingfield, M. J., Stenlid, J., Vasaitis, R., Slippers, B. (2012). Genetics of *Amylostereum* Species Associated with Siricid Woodwasps. The Sirex Woodwasp and its Fungal Symbiont: Research and Management of a Worldwide Invasive Pest, Springer Press.

Materials and Methods

Thirty three total sites at Tuskegee (2014-2015) and Talladega (Oakmulgee District) National Forests (2015), and Auburn University's Solon Dixon Center (2015) were established (Figure 2).

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Hanging panel insect traps were placed at each site and revisited every two weeks to collect trapped live and dead specimens.

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Specimens of siricids and other insect pests captured were keyed to species and cataloged (Fig. 4).

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Live insects were dissected in order to culture fungal and nematode samples (Fig. 3).

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Siricid, fungal, and nematode samples were identified using genetic analysis, and compared to specimens found in the southern hemisphere.

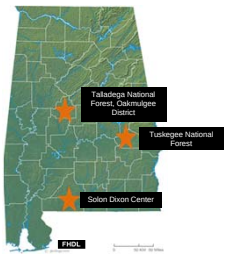

Figure 2. Field Sites for Trapping Survey

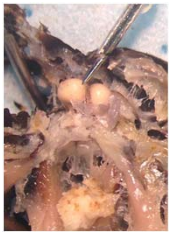

Figure 3. Dissected *S. nigricornis* abdomen, eggs and mycangium

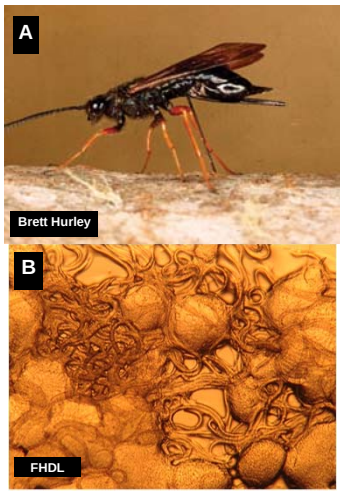

Figure 1. (A) Female *Sirex noctilio* on wood substrate. (B) *Deladenus siricidicola* nematode that is a known biological control of *S. noctilio*.

Discussion

- A total of 131 wood wasps were collected over the duration of this study
- Of all the woodwasps sampled, only 21.9% were infested with nematodes
- Peak flight season for bark and ambrosia beetle species occurred earlier in the year than *S. nigricornis* peak emergence
- Bark and ambrosia beetle populations would peak before predicted *S. noctilio* populations

Results

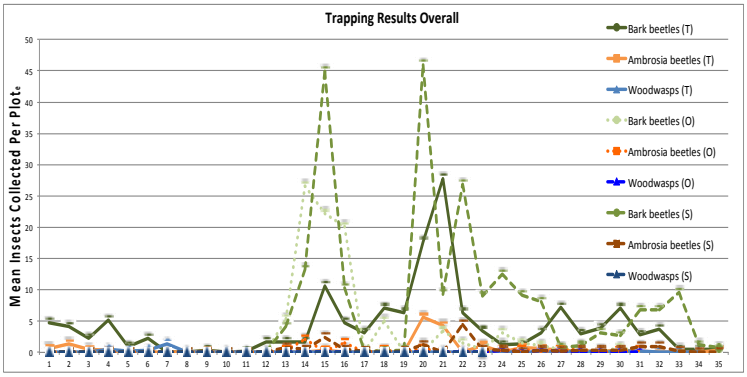

Figure 4. Trapping results overall. Mean collections of Bark beetles, Ambrosia beetles, and woodwasps in the three trapping localities. Collections run from 9/18/14 to 1/20/16.

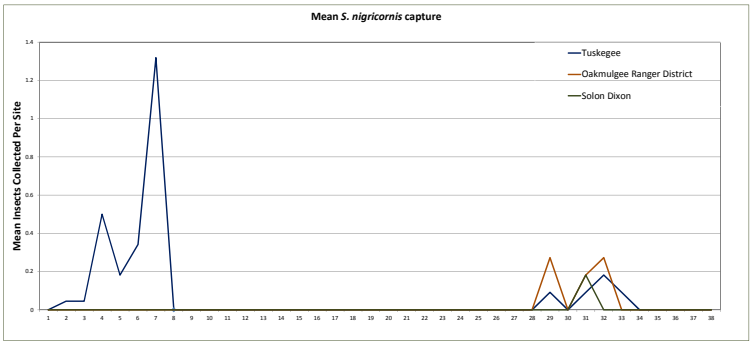

Figure 5. Mean *S. nigricornis* capture in three trapping localities. Capture numbers significantly higher in the first trapping season in Tuskegee National Forest. Collections run from 9/18/14 to 1/20/16.

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