

Invasive Woodwasp, *Sirex noctilio*: A Potential Pest of Pines in Arkansas

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The Sirex woodwasp, *Sirex noctilio* Fabricius (Hymenoptera:Siricidae), is an exotic wood-boring insect that serves as a vector for the disease fungus, *Amylostereum areolatum*. Together, this exotic wasp and fungus can colonize a wide range of North American pines and cause considerable tree mortality.

Invasiveness and Pest Potential

In South America, the insect has caused upwards of 80 percent mortality in plantations planted with non-native North American pine species. In the fall of 2004, *S. noctilio* was trapped for the first time in the United States in New York state (Hoebeke et al., 2005) and has subsequently been found in a number of counties in New York and Pennsylvania and adjacent areas in Ontario, Canada. The mode of introduction into the United States is likely to be through importation of infested wooden crates, pallets and other wood packaging.

Although not discovered in the southern states yet, this exotic insect pest poses a potential threat to the southeastern forest products industry, especially because all southern pine species are vulnerable to attack. Softwood production in the United States is a multibillion dollar industry that provides numerous commodities. In the southern states where pine production typically occurs in large, even-aged, managed stands, the

combined value of logs and bolts, lumber, veneer and pulpwood production is greater than \$8 billion per year (USDA, APHIS, 2006a). Even-aged pine stands and/or stressed pine trees are particularly at risk. However, because North American native pine ecosystems are more diverse and complex than pine plantations in South America and Australia planted with southern North American species, predicting the impact of *S. noctilio* is difficult.

Silvicultural treatments aimed at maintaining tree vigor and forest health may help reduce the impact of *S. noctilio* on pine forests. Physiological stress factors, including storm damage, drought, competition and defoliators, can predispose trees to attack by insects, including *S. noctilio*. Maintaining tree health may reduce the risk to attack. However, *S. noctilio* females will also oviposit into healthy trees, stressing the trees and predisposing them to future attacks (Thayer, 2007, USFS, 2006).

S. noctilio is native to Europe, Asia and northern Africa, where it is generally considered to be a secondary pest. It was inadvertently introduced into New Zealand, Australia, Uruguay, Argentina, Brazil, Chile and South Africa. In these Southern Hemisphere countries, *S. noctilio* attacks exotic pine plantations, most of which are planted with North American pine species, especially Monterey pine (*Pinus radiata*) and loblolly pine (*P. taeda*). Pines are

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the main hosts of *S. noctilio*, and the insect can complete its life cycle on numerous species within the pine genus (*Pinus*), including *P. attenuata*, *P. banksiana*, *P. brutia*, *P. calabrica*, *P. canariensis*, *P. caribaea*, *P. contorta*, *P. densiflora*, *P. echinata*, *P. elliotii*, *P. halepensis*, *P. jeffreyi*, *P. muricata*, *P. nigra austriaca*, *P. nigra*, *P. palustris*, *P. patula*, *P. pinaster*, *P. pinea*, *P. ponderosa*, *P. radiata*, *P. sylvestris* and *P. taeda* (Appendix A; USDA, APHIS, 2006a). In the United States (New York), *P. strobus* (white pine) and *P. resinosa* (red pine) have served as hosts for *S. noctilio*. Also, *S. noctilio* has been recorded on other conifers, such as larch (*Larix* spp.), Douglas fir (*Pseudotsuga menziesii*), spruce (*Picea* spp.) and fir (*Abies* spp.).

A prediction model for the potential distribution of *S. noctilio* in North America found that many areas of the United States, Canada and Mexico were suitable for establishment (Carnegie et al., 2006). *S. noctilio* can tolerate the climates found within the United States, and thus, APHIS expects that the absence of suitable host pines will probably be the factor most limiting the distribution of *S. noctilio*. *S. noctilio* can likely establish wherever pines are found in North America.

Native species of siricid woodwasps are present in many ecosystems in North America, but these native woodwasps differ from *S. noctilio* in that this non-native species will attack apparently healthy trees, whereas native siricids only attack trees that have been weakened (USFS, 2005).

Description and Biology of *Sirex noctilio*

The *Sirex* woodwasp is a relatively large insect, ranging from 1.0 to 1.5 inches long, with metallic (iridescent) blue-black

body coloration. The adult female is steel-blue except for reddish-brown legs. Pointing backwards from the underside of the abdomen is a spike-like projection which protects the ovipositor (egg-laying tube) when not in use. The middle segments of the abdomen in the adult male are orange-yellow, and the hind legs are thickened and almost wholly black.



Larvae are creamy white, legless and have a distinctive dark spine at the rear of the abdomen.

S. noctilio can go through its life cycle in as little as 10 months but may take up to two years in cooler climates. Males emerge before the females. Male *S. noctilio* engage in lekking behavior, in which they fly in single-sex swarms around the tops of trees; individual females fly into these leks to mate. Females that do not mate lay eggs that produce all males, whereas mated females produce offspring of both sexes. Females can begin to lay eggs one day after adult emergence. Adults do not feed; instead, they live on fat stored in their bodies. The adult life span can last up to 12 days, but females that deposit all their eggs may survive for an additional three to four days. Throughout their short life, females deposit between 20 and 500 eggs, depending on the size of the female (larger females generally lay more eggs).

In preparation for egg deposition, females land on trees, drill into the wood and assess the suitability of the tree for ovipositing. If the tree is unacceptable for oviposition, the female will fly to another tree. If the tree is acceptable, she lays a single egg and then continues to move upward in a spiral pattern, drilling up to four more holes and depositing the remainder of her eggs. Females, after ovipositing in one tree, may move on to additional trees as long as their eggs and energy reserves hold out. Mucus that is toxic to

pine trees is injected during drilling. The mucus causes the foliage to wilt and yellow, creating ideal conditions for the spread of fungus. The last hole is packed with spores of a fungus (*Amylostereum areolatum*). The fungus causes the wood to dry out, thereby creating a more favorable environment for egg hatching. After hatching, the *S. noctilio* larvae feed on this fungus. These effects together may kill the tree.

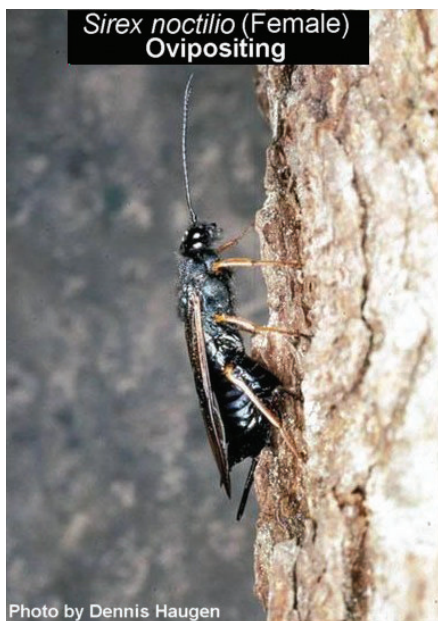
Larvae hatch from the eggs after a minimum of 9 days; however, the eggs may remain dormant for several months, overwintering in cooler climates. The number of larval instars varies from 6 to 12, and the larval stage generally takes 10 to 11 months. Larval tunnels created in the wood are tightly packed with very fine sawdust. Mature larvae pupate close to the bark surface. The pupal stage lasts between 16 and 21 days. When a female wasp emerges from her pupal skin, she takes up fungal spores from the tree from which she emerges and stores them in a special organ in her abdomen. The adult wasp bores its way out of the tree, leaving a characteristic round

exit hole, which varies in diameter according to the size of the wasp.

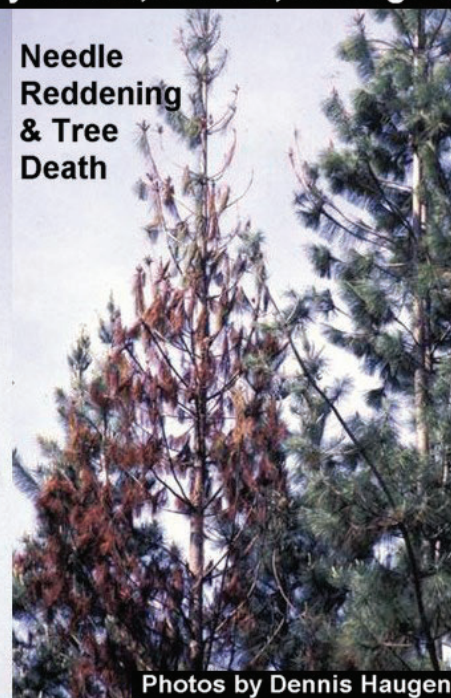
At low population levels, *S. noctilio* selects stressed and injured trees for egg laying; however, at high population densities, *S. noctilio* will select healthy trees. Foliage of infested trees initially wilts and then may change color from dark green to light green to yellow and finally to red during the three to six months following attack. In the northeastern United States, some trees struck by *S. noctilio* have wilted and the needles have turned brown without the gradual color change. Infested trees may have resin beads or dribbles at the egg-laying sites, but uninfested trees may also exhibit resin beads and dribbles as well.

Contact the Arkansas State Plant Board (501-225-1598) or your local county Extension office for more information.

Photo credits: Dennis A. Haugen, USDA Forest Service, Forest Health Protection, St. Paul, MN.



Tree Symptoms caused by larvae, mucus, & fungus



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