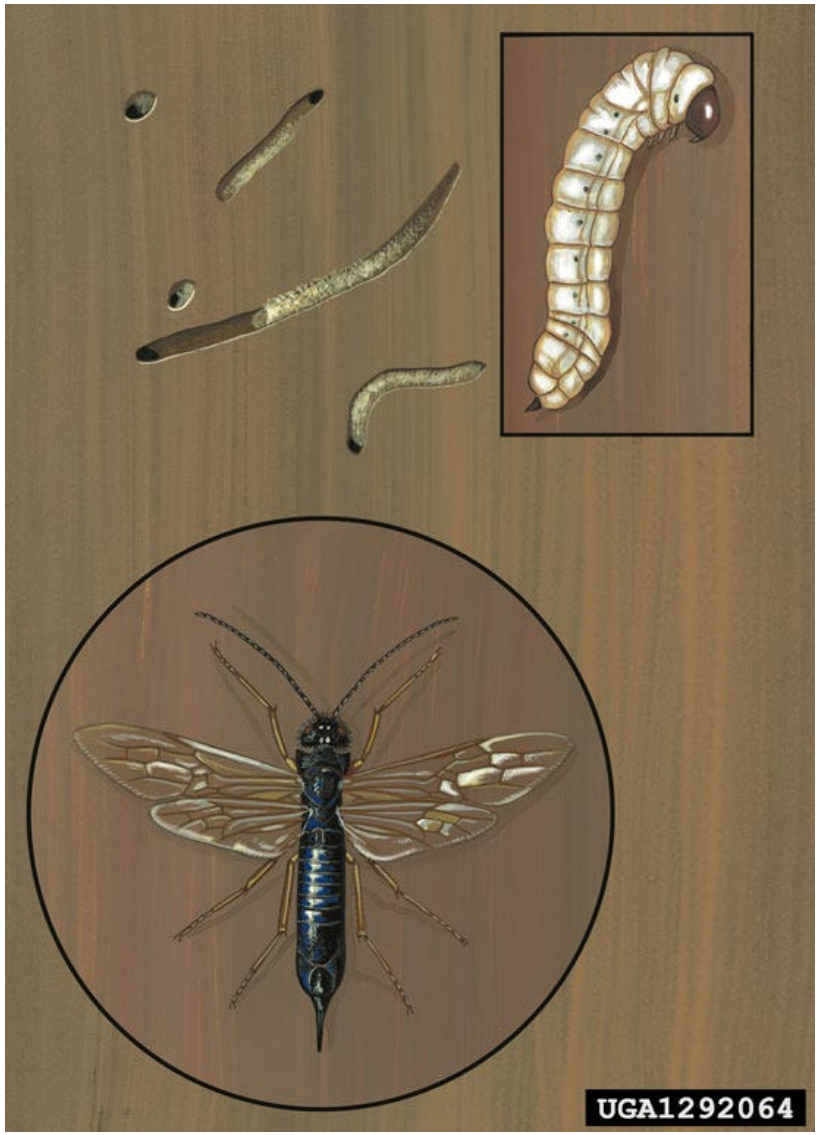
Visual Survey Guide

Sirex noctilio (Fabricius)
European Wood Wasp

Prepared by APHIS/PPQ/PDMP



Illustration, Robert Dzwonkowski, Poland

Survey Overview

Surveying for *Sirex noctilio* is primarily visual inspection of hosts (e.g., any pine species, with "preferred" hosts being *Pinus radiata, P. strobus, P. taeda, P. palustris,* and *P. australus*).

Use three types of inspection:

1. Aerial--a coarse-grained survey, using observers in an aircraft to plot evidence of damage.
2. Forest--this survey requires observant persons on the ground to search for damage.
3. Ground-check--a fine-grained inspection of trees that have been identified as potentially infested by aerial or forest surveillance. Ground checks may require stripping the tree to inspect for galleries and fungus.

General symptoms of *Sirex noctilio* infestation (best observed by survey type) include:

1. Tree crowns turning light green to yellow to reddish brown in the spring. (aerial, forest)
2. Beads of resin are visible on the bark. These arise from oviposition drills. (forest, ground-check)
3. Exit holes (3-8 mm diameter). (forest, ground-check)
4. The fungus arising from drills eventually creates a stain in the cambial layer. Stains are long, narrow brown bands along the grain. In later infestations, the fungal staining indicates that it has invaded all tree tissue. (ground-check)
5. Larvae in cambial tissue, or deep in drills. (ground-check)
6. Frass-filled serpentine galleries in cambium. Galleries may turn inward towards heartwood and then turn back toward the bark, as the time for pupation draws near. Pupae are typically found within 5 cm of the bark. (ground-check)

Auxilliary forest surveillance: Train persons with intimate knowledge of the forest or working in the forest (e.g., naturalists, foresters, loggers, sawmill personnel) to be alert for signs of *Sirex noctilio* activity (e.g., adult insects, oviposition drills, exit holes, larval galleries, cambial staining). Use handouts that describe *Sirex noctilio* and provide contact information.

Aerial surveys can assist planning by locating habitats that have large areas of pine trees. For a detection survey in areas that are not known to be infested with *Sirex noctilio*, a sampling frame will not have been determined, and quadrat sampling will allow surveyors to work within a structure and quantify results.

Quadrat Sampling: Follow a similar sampling pattern for each area surveyed. Local terrain will dictate the shape of the quadrat sample unit (e.g., square, rectangle, circle).

Forest surveys supplement observations of persons working in forested areas. These consist of individuals walking units of forest that contain hosts and checking hosts for signs of *Sirex noctilio* infestation. Determine unit size and sampling frequency based on the level of risk presented by the area. As a reference point, for mature forest trees over 4m use one hundred square meter plots (i.e. 10m x 10m or 7.07m x 14.14m). Inspect at least 10 host trees from each quadrat.

Since injured, dead or fallen trees are those most likely to be infested by *Sirex noctilio*, these should be inspected preferentially. Preferentially inspect pines that appear diseased or stressed and have resin flow or beads of resin on the bark.

Look for the following life stages:

Eggs: Look for drills. Drills are grouped in five or six sites with one site being empty of eggs but containing a cache of fungus.

Larvae: Check cambial tissue beneath the bark for larvae or serpentine larval galleries. Tissue may be stained and dry from activities of the fungus.

Collect eggs and larvae with sufficient host material (i.e., wood and fungus) for rearing purposes.

Delimiting Survey Decision Table			
If you find:	In an area that is:	Take this action:	And supplement with:
One or more adults	Apparently in the original infestation site*	Initiate delimiting survey in 25-hectare area.	Aerial survey; 1, 10-tree plot
One or more (any stage)	Within a 25- hectare area	Extend delimiting survey to 225 hectares by adding 25-hectare blocks around original area	Visual survey 100 hosts per hectare in each 25-hectare area; Aerial survey; 9, 10-tree plots
	Within a 225- hectare area	Extend delimiting survey to 625 hectares by adding 25-hectare blocks around previously surveyed area	Visual survey 100 hosts per hectare in the 25-hectare block. Aerial survey; 25, 10-tree plots
*Conservatively determined by the presence of larvae, detections of number of sufficiently dispersed adults, backtracking, or other means			

HOSTS	Photo Representative of Type	HOSTS
Pine* (preferred)		
Fir		

Larch		
Douglas Fir		

Spruce		

DETECTION	AERIAL (Photos illustrate low level damage in loblolly pine plantation)	DETECTION, AERIAL
Sirex often affects trees along dried-up watercourses, in drought areas, recently burned areas and large fast-grown trees in a stand.	 photo: William Ciesla	
	 photo: William Ciesla	

DETECTION	FOREST
Look for “flagged,” wilted, yellowed, dried foliage Over 90% of emergences have been recorded (in NZ plantations) from chest level to the top diameter of 3 inches.	 Photo: Stanislaw Kinelski,

DETECTION, FOREST

In standing trees successful emergence is recorded from branches one inch thick (close to the main trunk)and from small trees .

Photo: Bernard Slippers, FABI

Do not overlook logs, dead limbs and fallen timber--sirex can use these successfully if they exceed three inches in diameter.

Photo: Paula Klasmer

DETECTION	GROUND CHECK
Resin drips or beads	 Photo: Bernard Slippers, FABI
Exit Holes in Dead Wood	 Photo: Bernard Slippers, FABI

DETECTION, GROUND CHECK

Round Drills

Drills are typically described as being “perfectly round.”

Oviposition behavior is variable and the selection of an appropriate oviposition site depends greatly on the presence of adequate moisture to support the growth of the fungus.

Number of drills: 1-5. If multiple drills are clustered, one of the group is usually filled with a provision of fungus.

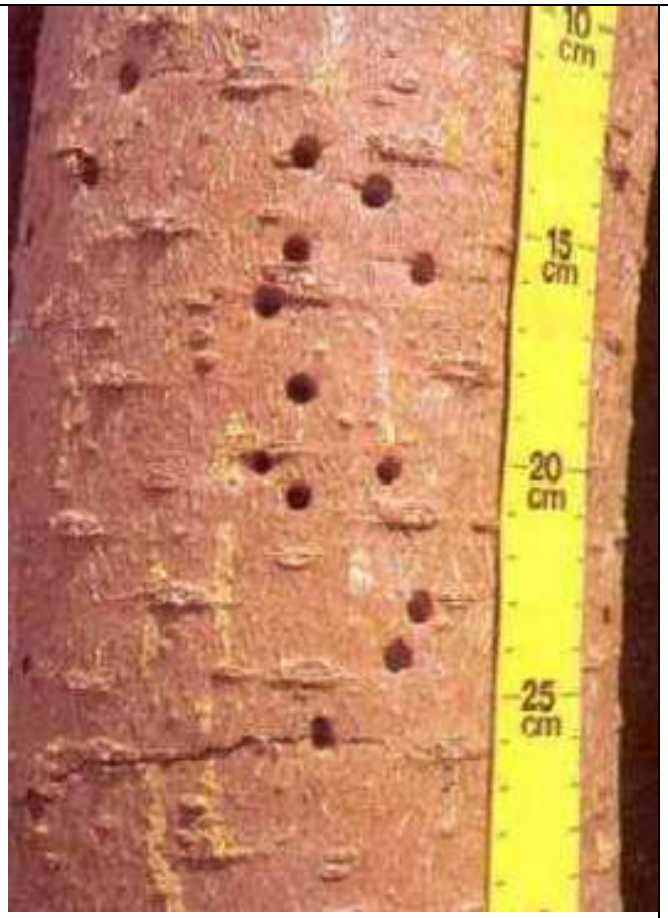
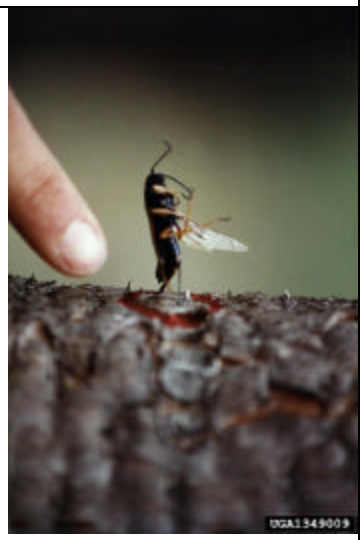
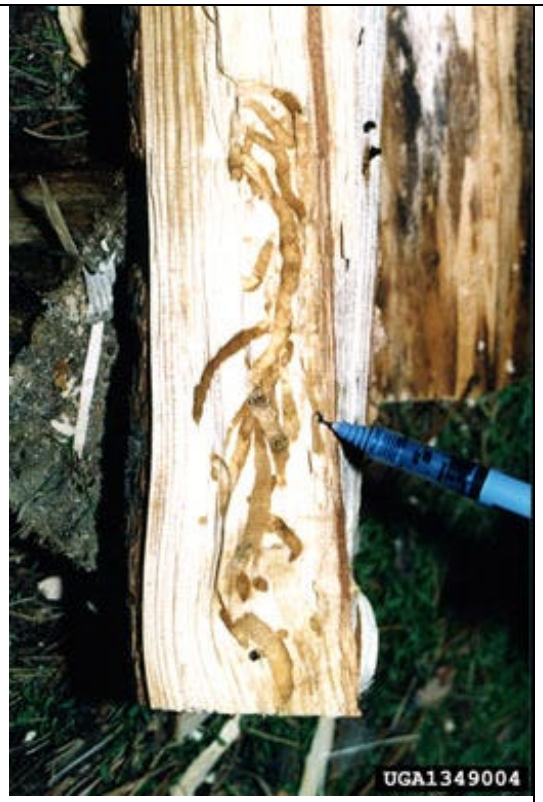


Photo: Bernard Slippers, FABI

Sirex females usually work up the trunks of trees near ground level. The distance between drills may vary between 3 and 20 inches. The greatest number of drills per foot of trunk are made immediately below, and for several feet above, the first whorl of green branches. Sometimes drills are concentrated in the mid-crown area of the trunk.	photo: Gyorgy Csoka		

Symptoms	Inside Tree	
Larval Tunnels	 Photo: Bernard Slippers, FABI	
	 photo: Gyorgy Csoka	

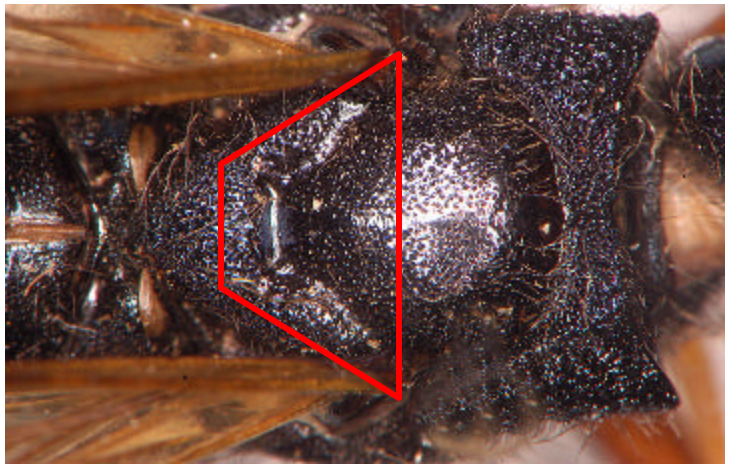
	Photo: Stanislaw Kinelski, 	
The female may die while ovipositing when her stores of body fat deplete.	Photo: Paula Klasmer 	

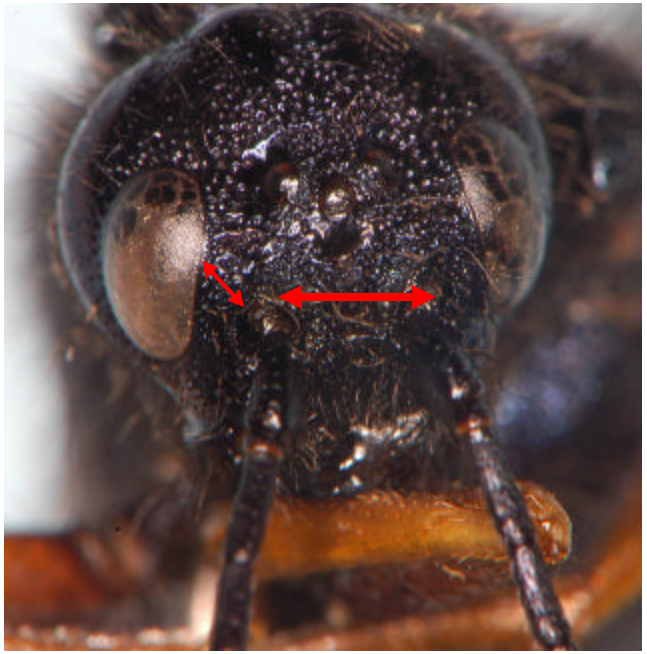
Larvae within their galleries.	Photo: Paula Klasmer		

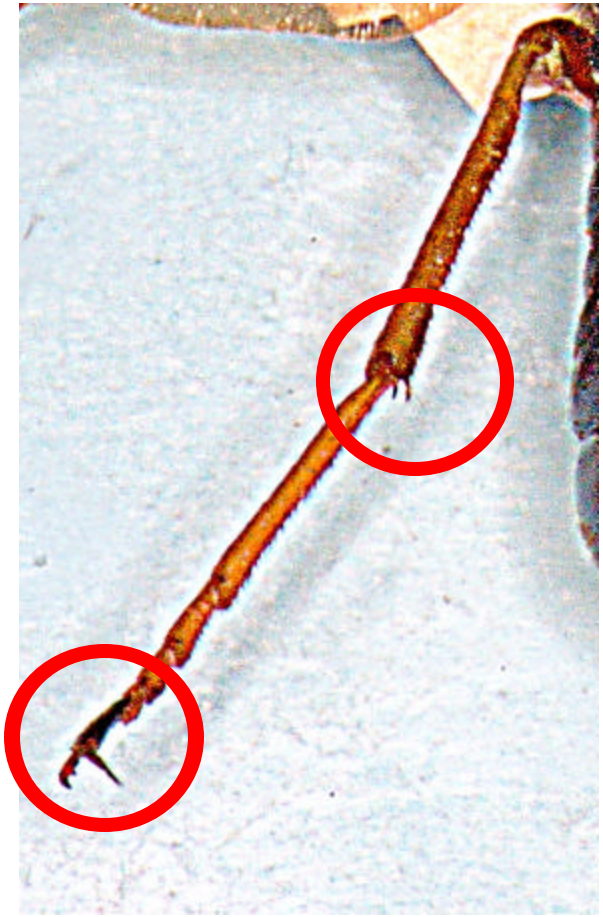
Insect		
Larva bears characteristic posterior “spike” of horntail.	 Photo: Paula Klasmer	INSECT, LARVA

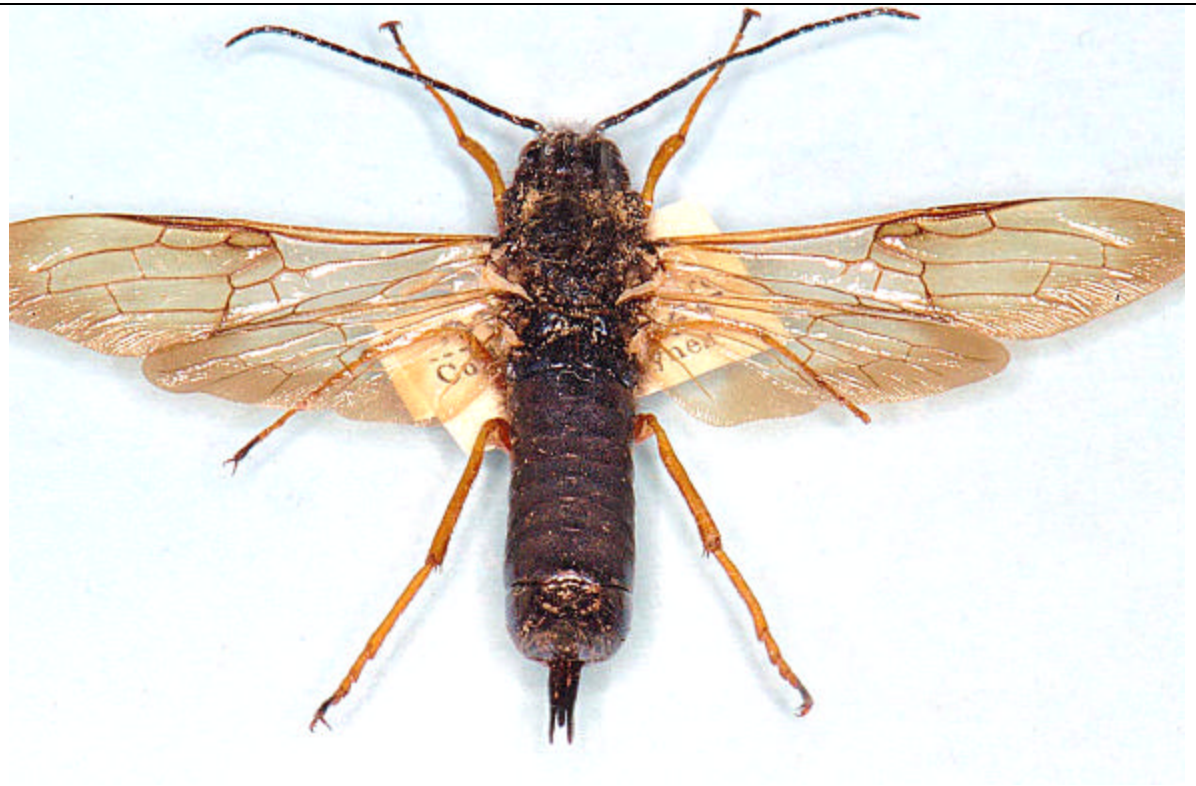
Pupa	 photo: William Ciesla	INSECT, PUPA

Adult	Any wasp exhibiting the following should be considered a *S. noctilio* suspect by field personnel and submitted to an area identifier for further examination:	**INSECT, ADULT**
GENERAL DESCRIPTION: 25-40 mm metallic blue-black “horntail” wasp with orange legs. *Female*: Head and body completely metallic blue; legs orange. *Male*: Head and thorax metallic blue; abdomen orange at center, black at base and apex; legs with femora orange, hind tibia black.	? ? 	

Typically over 20 mm long, some females reach 45 mm in length, including the ovipositors. The "cornus", a prominent upturned horn, spine or spear-like plate is usually present on the last abdominal segment.		
Siricids are distinguished from other, similar sawflies by the diagonal furrow of the mesonotum and an combination of other characters including the emarginated posterior margin of the pronotum,		

Interantennal distance equal to or less than 1 1/2 times the distance between the antenna and eye,		
Females bear a long, non-retractable ovipositor that is adapted for piercing wood . Note pits on ovipositor. On *Sirex noctilio*, these are large and close together.		

Sirex noctilio hind tibiae are characterized by two apical spurs. Apical two tarsal segments are blackish.		

SEPARATING CHARACTERS	*Sirex noctilio* can be separated from species indigenous to North America by these characters.	
• Antennae always black. • Apical two tarsal segments blackish. • Female ovipositor shorter than forewing. • Female saw sheath shorter than oblong plate • Pits on female ovipositor large and close together. • Mesopleuron with closely set punctures, in the middle; interspaces between punctures narrow and much less than the diameter of a puncture.		**SEPARATING CHARACTERS**

Tree Images: USDA-NRCS. 2005. **The PLANTS Database** (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Photos by Bernard Slippers courtesy of Dr. Slippers and the Forestry and Agricultural Biotechnology Institute, University of Pretoria, South Africa.

Other individually credited photos were acquired at http://www.invasives.org/

Sirex noctilio Adult Identification Photos: All, Susan E. Ellis, USDA/APHIS/PPQ.