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Version 3  
6 July 2015

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The pine sawyer beetles (*Monochamus* spp.) are a widespread genus of longhorn beetles with several members of economic importance. Within this group are two species that are considered potentially invasive pests: the small white-marmorated longhorned beetle (*Monochamus sutor*) (Fig. 1) and the Japanese pine sawyer (*Monochamus alternatus*) (Fig. 2). *Monochamus alternatus* feeds primarily on pines (*Pinus*) but will attack a variety of conifers and some deciduous trees. *Monochamus sutor* attacks a variety of conifer species including fir (*Abies*), larch (*Larix*), and spruce (*Picea*). Both species are known to carry the pine wood nematode (*Bursaphelenchus xylophilus*) and other phytoparasitic nematodes that are capable of killing trees and spreading bacterial diseases. The beetle itself feeds on the phloem as a larvae and in the crown as an adult (Figs. 3-4) but is unlikely to directly kill its host.



Fig. 1: *Monochamus sutor* on tree (photo by Stanislaw Kinelski, Bugwood.org).

*Monochamus* belongs to the family Cerambycidae, which are known as the longhorned beetles. Members of this family are recognized by their highly elongate antennae, in males sometimes reaching twice the length of body. *Monochamus* belongs to the subfamily Lamiinae which is distinguished by its hypognathus head, acute palpi, and obliquely sulcate anterior tibia.

The genus *Monochamus* contains over 100 species and is found worldwide. Eight species and six additional subspecies occur in the U.S. *Monochamus* adults are identified by large acute lateral tubercles on the pronotum, coarsely rugose elytral bases, and elongate front legs in the male. Neither *M. alternatus* nor *M. sutor* have been detected in the United States.

This aid is designed to assist in the sorting and screening of *M. alternatus* and *M. sutor* suspect adults collected in Lindgren funnel traps and by visual surveys in the continental United States. It covers basic Sorting of traps, First Level, and Second Level screening, all based on morphological characters. Basic knowledge of Coleoptera morphology is necessary to screen for *M. alternatus* and *M. sutor* suspects.



Fig. 2: *Monochamus alternatus* on tree (photo by William M. Ciesla, Forest Health Management International, Bugwood.org).

# Sorting

## Pine Sawyer Beetles

*Monochamus sutor* (Linnaeus) and *M. alternatus* Hope

Insects collected during *Monochamus* surveys should be sorted initially for the presence of beetles of the appropriate size, color, and shape.

1. Beetles are between 15 mm (0.6 inches) and 28 mm (1.1 inches) in length.
2. Beetles have highly elongate antennae, over twice body length (Fig. 5).
3. Beetles are black, or mottled brown with white patches (Figs. 11 & 14).

Beetles meeting these requirements should be forwarded to Level 1 Screening (Page 3).

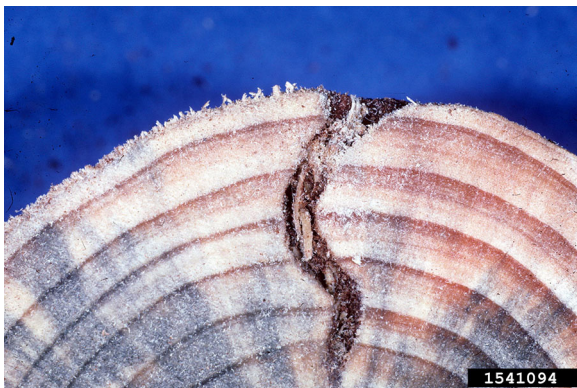


Fig. 3-4: *Monochamus* sp. galleries infected with bluestain fungi and containing larvae (top) and pupae (bottom). Despite their large size, *Monochamus* do little direct damage the host tree. They burrow in the phloem and heartwood where they feed on wood and symbiotic fungi. Most trees that are killed die as the result of infection by parasites vectored by the beetle. These include bluestain fungus, the pine wood nematode, and a variety of pathogenic bacteria (photos by Lacy L. Hyche, Auburn University, Bugwood.org).



Fig. 5: male *Monochamus* sp.



Fig. 6: female *Monochamus* sp.

Fig. 5-6: Lateral views of male (top) and female (bottom) *Monochamus* sp. *Monochamus* is a sexually dimorphic genus with males having antennae and forelegs significantly longer than those of females. Conversely, the overall body size of females is usually greater than that of males, although some overlap does occur.



# Level 1 Screening

## Pine Sawyer Beetles

*Monochamus sutor* (Linnaeus) and *M. alternatus* Hope

Suspect adults should be pinned and properly labeled. Level 1 Screening is based on characteristics of the head, tarsal claws, general dorsal surface, and antennae. It is designed to separate *Monochamus* from related genera.

### Head

The heads of the subfamily Lamiinae are vertical with the genial margin directed posteriorly rather than ventrally (Fig 7).



Fig. 7: Head of *Monochamus* sp. In the Lamiinae the head is vertically oriented with the mouthparts directed ventrally, and the genial margin is directed posteriorly.

### Tarsal Claws

The tarsal claws of *Monochamus* are divergent (Fig. 8) rather than being divaricate or bifid.

### Antennae

The antennal scape of *Monochamus* has a distinct carinate ring called a “cicatrix” at the apex (Fig. 9).

### General Dorsal Features

The prothorax of *Monochamus* bears a pair of large prominent lateral tubercles (Fig. 10). The elytral bases are coarsely rugose and the elytra themselves are uniformly covered with pubescence (Fig. 10). The related genus *Anoplophora* (which includes the Asian longhorned beetle - ALB) is always black in color and has pubescence only in distinct patches.

Specimens meeting these requirements should be forwarded to Level Two Screening.



Fig. 10: Dorsal view of *Monochamus marmorator*. Note the pair of large horns on the pronotum (circled), the coarsely rugose elytral bases, and the uniformly pubescent elytra. Many species have elaborately patterned pubescence.



Fig. 8: Tarsal claws of *Monochamus* sp.

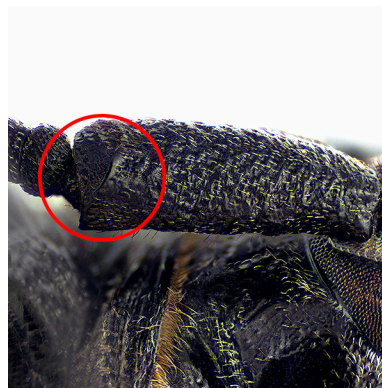


Fig. 9: Antennal base of *Monochamus* sp. The scape has a distinct cicatrix at its apex (circled).

# Level 2 Screening

## Pine Sawyer Beetles

*Monochamus sutor* (Linnaeus) and *M. alternatus* Hope

Level 2 screening is designed to separate *M. alternatus* and *M. sutor* suspects from native *Monochamus*. Screening is based on characters of the elytra and scutellum as well as general notes on size.

*Monochamus* spp. are sexually dimorphic (Figs. 5-6), with the male having antennae twice as long as the body and females having antennae 1.5 times as long as the body.

### *Monochamus sutor*

*Monochamus sutor* (Fig. 11) bears a close resemblance to the native *M. scutellatus* (Fig. 12). Both beetles are black in color which distinguishes them from other native *Monochamus* (Fig. 13). The apices of their elytra are rounded and unarmed by spines at the suture (Fig. 20). The two species can be distinguished by the larger amounts of pubescence on the elytra of *M. sutor*. Usually this pubescence is yellow in color and occurs in dense patches. In *M. scutellatus* the pubescence is more evenly distributed and is snow white in color. Both species have a densely pubescent scutellum where the difference in color of the pubescence can be easily observed (Figs. 25-26).

### *Monochamus alternatus*

The elytral apex of *M. alternatus* (Fig. 21) is more narrowly rounded than that of *M. sutor* (Fig. 20). *Monochamus alternatus* is reddish brown to black in color with two broken stripes of orange pubescence on the pronotum (Fig. 27). Two native species, *M. carolinensis* (Fig. 15) and *M. titillator* (Fig. 16) bear a close resemblance to *M. alternatus* (Fig. 14). The three can be distinguished by the unarmed and somewhat flattened elytral apices of *M. alternatus* compared to the broad tooth seen in *M. carolinensis* and the narrow conical tooth of *M. titillator* (Figs. 21-23). Other non-target species (Figs. 17-19) lack the tooth entirely (e.g., Fig. 24).



Fig. 11: *Monochamus sutor* (target)



Fig. 12: *Monochamus scutellatus*



Fig. 13: *Monochamus obtusus*



# Level 2 Non-targets

# Pine Sawyer Beetles

*Monochamus sutor* (Linnaeus) and *M. alternatus* Hope



Fig. 14: *Monochamus alternatus* (target)  
(Photo by Steven Valley, Oregon  
Department of Agriculture, Bugwood.org).



Fig. 15: *Monochamus carolinensis*.



Fig. 16: *Monochamus titillator*.



Fig. 17: *Monochamus mutator*.



Fig. 18: *Monochamus clamator*.



Fig. 19: *Monochamus notatus*.



# Level 2 Non-targets

# Pine Sawyer Beetles

*Monochamus sutor* (Linnaeus) and *M. alternatus* Hope



Fig. 20: *Monochamus sutor* (target).



Fig. 21: *Monochamus alternatus* (target).  
(Photo by Steven Valley, Oregon Department of Agriculture, Bugwood.org).



Fig. 22: *Monochamus carolinensis*.



Fig. 23: *Monochamus titillator*.



Fig. 24: *Monochamus clamator*

Figs. 20-24: Elytral apices of various *Monochamus* spp. The apex of *M. sutor* is broadly rounded while that of most other *Monochamus* are more acute and often armed with spines as seen with *M. carolinensis* and *M. titillator*. The apex of *M. alternatus* is narrowed but unarmed.



Fig. 25: *Monochamus sutor* (target).



Fig. 26: *Monochamus scutellatus*.

Figs. 25-26 (left): Scutellums of *M. sutor* and *M. scutellatus*. Note the difference in the color of the pubescence.

Suspect *M. sutor* (black cerambycids with vertical heads, a circatrix on the antennae, broadly rounded elytral apices, and small spots of yellow pubescence) and *M. alternatus* (red-brown cerambycids with vertical heads, a circatrix on the antennae, narrowed but unarmed elytral apices, and two stripes of orange pubescence on the pronotum) should be sent forward for identification. Specimens must be labeled and carefully packed to avoid damage during shipping.

Fig. 27 (below) Pronotum of *Monochamus alternatus*. Note the two stripes of orange pubescence. (Photo by Steven Valley, Oregon Department of Agriculture, Bugwood.org).



## Key to Sort and Screen *M. sutor* and *M. alternatus* Suspects in the United States

1. Beetles approximately 15-28 mm long; antennae significantly longer than body and with distinct circatrix on scape (Fig. 9); coloration black or red-brown with uniformly pubescent elytra, mouthparts directed ventrally (Fig. 7); tarsal claws divergent (Fig. 8) ..... 2
- 1'. Beetles larger or smaller than 15-28 mm long; antennae not significantly longer than body or without distinct circatrix; color not black or red brown or without uniformly distributed pubescence on the elytra; mouthparts directed forward; or tarsal claws divaricate or bifid ..... Not suspect
2. Elytral apices rounded (Fig. 20); body usually black ..... 3
- 2'. Elytral apices flattened or armed with tooth (Fig. 21); body usually reddish brown ..... 4
3. Body with large amount of pubescence; patches of pubescence yellow in color (Fig. 25) ..... ***M. sutor* suspect**
- 3'. Body with less pubescence, patches of pubescence white in color (Fig. 26) ..... Not suspect
4. Pronotum with two stripes of orange pubescence (Fig. 27); elytral apices not armed with tooth (Fig. 21) ..... ***M. alternatus* suspect**
4. Pronotum without stripes of orange pubescence; elytral apex armed with tooth (of various forms) (Figs. 22-23) ..... Not suspect

## Citation

Benzel, J. S. 2015. Screening aid: Pine sawyer beetles, *Monochamus sutor* (Linnaeus) and *M. alternatus* Hope. Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. 7 pp.

## References for more information on *Monochamus sutor*, *M. alternatus*, and non-targets

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## Acknowledgments

Funding for this project was provided to J. S. Benzel through section 10201 of the FY2014 Farm Bill. I would like thank Terrence Walters (USDA-APHIS-PPQ-S&T ITP) and USDA-APHIS-PPQ National Identification Services for support of this work and access to imaging equipment. Boris Kondratieff, Donald Bright, and Todd Gilligan (Colorado State University) provided advice on species identification, image editing, and screening aid formatting.