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The pine shoot beetles, *Tomicus* spp. (Fig. 1), are a widely distributed group of pests in Europe and Asia. The primary host of the genus is pine (*Pinus*) but these beetles will also infest a variety of other conifer species including firs (*Abies*) and spruce (*Picea*). The adults and larvae feed in the cambium of tree boles or in shoots depending on life stage, damaging the tree by girdling and spreading pathogenic fungi (Figs. 2-4).

The genus *Tomicus* is placed in the family Curculionidae (subfamily Scolytinae) which is comprised of weevils and bark beetles. Members of this family are highly variable but almost all species share a distinct club on the end of their antennae consisting of three segments. The subfamily Scolytinae, which *Tomicus* is a member of, consists of the bark beetles. In general, members of Scolytinae are small (<10mm long) pill shaped beetles of a reddish brown or black color. Some authors consider Scolytinae to be a distinct family (Scolytidae).

The genus *Tomicus* includes eight species, which are native only to Europe and Asia. Members can be distinguished by having raised crenulate basal margins of the elytra, a six segmented funicle, close but separated procoxae, eyes entire, and erect setae in single rows on the elytral interstria.

Only one species, *T. piniperda*, has been introduced and established in the United States. Members of this species were first detected in 1992 near Cleveland, Ohio, but it is thought to have become established in the region several years before the first reports. *Tomicus piniperda* is currently found in 17 states in the Northeast and Midwest as well as in the provinces of Ontario and Quebec. In addition to *T. piniperda*, the CAPS program has designated two Palearctic species of *Tomicus*, *T. destruens* and *T. minor*, as potentially invasive. All species of *Tomicus* are known to be destructive. Because the species of *Tomicus* are difficult to differentiate, the entire genus is treated here as a single taxon. A quality, high powered microscope is required to examine the characters necessary to identify these beetles.

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



Fig. 1: *Tomicus piniperda* in a pine shoot (photo by, Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org).



Fig. 2: *Tomicus minor* galleries (photo by Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org).

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

1. Beetles are between 2 mm (0.1 inches) and 3 mm (0.15 inches) in length.
2. Beetles are pill-like in shape.
3. Beetles are black, or reddish-brown colored.

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



Fig. 3: Tree attacked by *Tomicus piniperda*. During a bark beetle attack trees will show little sign of damage other than a series of small bore holes. Often it is not apparent that bark beetles have infested a tree until after they have emerged (photo by . Richard Hoebeke Cornell University, Bugwood.org).



Fig. 4: *Tomicus* galleries infected with bluestain fungus. Many types of bark beetle spread this symbiotic fungus which aids in the destruction of the cambium of the tree (photo by USDA Forest Service - Northeastern Area Archive, USDA Forest Service, Bugwood.org).

Level 1 Screening

Pine Shoot Beetles

Tomicus spp.

Suspect adults should be pointed and properly labeled. Level 1 Screening is based on characteristics of the antennae, general dorsal surface, eye, procoxae, and frons.

Antennae

Scolytids have relatively stout, geniculate, clubbed antennae. The clubs are made up of three antennomeres and can be solid, annulated, or occasionally lamellate. The scape will always be well developed (Fig. 5). In *Tomicus* the antennal funicle has six segments which differentiates it from most native members of the Hylurgini whose funicles are either five or seven segmented (Figs. 6-8).



Fig. 5: Antenna of *Tomicus* spp. Note the long scape, large three part club and six segmented funicle (labeled).

General Dorsal Surface

Beetles in the tribe Hylurgini, of which *Tomicus* is a member, have procurved basal elytral margins armed with a crenulate ridge (Fig. 9-14). The scutellum of members of the tribe is small but present and the head is usually easily seen in dorsal view. The setae are hairlike rather than scalelike. All species except for the Asian *T. puellus* have setae in single rows along the interstriae. Other Hylurgini are somewhat more setacious (Figs. 15-17).



Figs. 6-8: Antennae of other members of the Hylurgini: *Dendroctonus* spp. (top), *Pseudohylesinus* spp. (middle) and *Xylechinus* spp. (bottom). Note the number of segments in the funicle (5 or 7).

Eye

The eyes of *Tomicus* are entire in form (Fig. 20) rather than being emarginate.

Procoxae

The procoxae in *Tomicus* are nearly contiguous but are separated by a thin plate (Fig. 19).

Frons

The frons of *Tomicus* are armed with a raised median longitudinal line extending from the epistoma to the upper level of the eyes (Fig. 18).



Fig. 9: *Tomicus piniperda*



Fig. 10: *Tomicus minor*



Fig. 11: *Tomicus destruens*



Fig. 12: *Tomicus puellus*



Fig. 13: *Tomicus brevipilosus*



Fig. 14: *Tomicus pilifer*



Fig. 15: *Pseudohylesinus* sp.



Fig. 16: *Xylechinus* sp.



Fig. 17: *Dendroctonus* sp.

Figs. 15-17 (left): Native genera of the tribe Hylurgini. These beetles can be differentiated from *Tomicus* by differences in the setae structure and number of funicular segments of the antennae.



Fig. 18: Frons of *Tomicus* spp. Note the raised median line (circled).

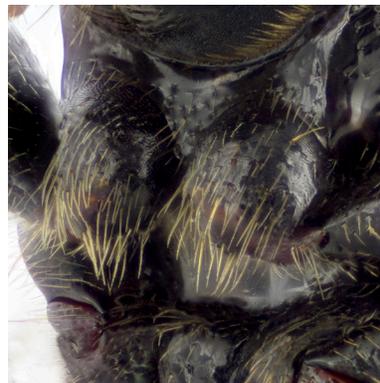


Fig. 19: Procoxae of *Tomicus* spp. While the coxal cavities of this genus are close together they are not contiguous as with some members of the tribe.



Fig. 20: Eye of *Tomicus*. In *Tomicus* the eyes are entire in form, fully oval in shape and not divided by a small projection of the head capsule down the eyes center.

The different *Tomicus* species are difficult to differentiate and their identification is beyond the scope of this aid. For keys to *Tomicus* see Brodel (2009) and Kirkendall et al. (2008).

Suspect *Tomicus* specimens (scolytids with six funicular segments of the antennae, eyes entire in form, narrowly separated procoxae, and hair like setae) should be sent forward for identification. Specimens must be labeled and carefully packed to avoid damage during shipping.

Key to Sort and Screen *Tomicus* Suspects in the United States

1. Beetles approximately 2-3 mm long; pill shaped and with black, or brown, coloration..... 2
- 1'. Beetles larger or smaller than 2-3 mm long; not pill shaped; or color not a shade of black, brown, or tan.....Not *Tomicus*

2. Antennae geniculate with a large club made up of three segments on the end (Fig. 5); basal margins of elytra armed with carina procurved (Figs. 9-14); scutellum small; head not covered by pronotum; antennal funicle six segmented (Fig. 5)..... 3
- 2'. Antennae not geniculate or without a large club made up of three segments on the end; basal margins of elytra unarmed and forming a straight transverse line across the body; scutellum wide or absent; head may or may not be covered by pronotum; antennal funicle not six segmented (Figs. 6-8).....Not *Tomicus*

3. Eye entire (Fig. 20); procoxae narrowly separated (Fig. 19); setae hairlike and usually in rows along interstria; frons armed with raised median line (Fig. 18)..... ***Tomicus suspect***
- 3'. Eye variable, procoxae contiguous or widely separated. setae either scalelike or confused. frons unarmed;.....Not *Tomicus*

Citation

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References for more information on *Tomicus* spp. and non-targets

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