Tomicus destruens (Wollaston)

Coleoptera: Curculionidae

Pine shoot beetle

Host(s)	CAPS-Approved Survey Method
Main/Primary hosts *Pinus halepensis* (Aleppo pine), *Pinus pinaster* (Maritime pine) **Other hosts** *Pinus* spp. (Pine), *Pinus brutia* Ten. (Calabrian pine), *Pinus canariensis* (Canary Island pine), *Pinus pinea* (Italian stone pine), *Pinus radiata* (Monterey pine), *Pinus sylvestris* (Scots pine) (Guerrero et al., 1997; Ciesla, 2003; Horn et al., 2006)	Ethanol and ultra-high release alpha-pinene in a multi-funnel trap.

Reason for Inclusion in Manual

Tomicus destruens was added to the manual in 2010. *Tomicus destruens* is on the AHP Prioritized Pest List for FY2011.

Pest Description

Eggs:

Eggs are pearly white in color (Ciesla, 2003).

Larvae:

"Head capsule index [maximum head width ÷ head length to mandibles] 0.95. Frontal shield broad, triangulate with straight sides and distinct endocarinal line. Frontal setae five pairs of which pair 2 is the longest. Epistoma posteriorly limited by a continuous, slightly curved line which laterally bends backwards. Medially, on the anterior edge a large tubercle.

The larva described is a typical *Blastophagus* larva, but it differs in some important details from both *piniperda* and *minor* larvae. It is easily distinguished from the latter by the large medial tubercle on the epipharynx, which tubercle is missing in the *minor* larvae. In the *piniperda* larva, the tubercle is only vestigial or missing. Further, it differs from the *piniperda* larva in the number of medial epipharyngeal setae, invariably three pairs in *destruens*, and four in *piniperda*. The relative lengths of the clypeal setae is different too, with little difference in *piniperda* and large

in *destruens*. There are other differences too but those mentioned here are the most important" (Lekander, 1971).

Pupae:
"The pupae are white, mummy-like and have some adult features including wings that are folded behind the abdomen" (Ciesla, 2003).

Adults:
"Mature colour of elytra reddish, antennal club of the same colour of the antennal funicle, third antennal segment with abundant vestiture of many setae, upper margin of the first antennal club segment with only short and regular setae, second interstriae of the declivity transversely wrinkled, with 2 or 3 rows of punctures, length/width of elytra <1.7, elytra/pronotum length <2.35, elytral length/pronotum width <1.9" (Faccoli, 2006).

"Callow adults of both species [*T. destruens* and *T. piniperda*] have a similar homogeneous yellow colour, thus for young specimens other characters must be used for identification" (Faccoli 2006). "The declivity ... [is] weakly, irregularly, transversely wrinkled, most easily seen on interstiae [*sic*] 2 where no setae occur, but in most *T. destruens* specimens the sculpture of the second declivital interstriae was more wrinkled than in *T. piniperda*" (Faccoli, 2006).

"The ratio between length and width of the elytra was different between species, higher in *T. piniperda* (>1.7) than in *T. destruens* (<1.7). Also, the ratio between elytra and pronotum length was higher in *T. piniperda* (>2.35) than *T. destruens* (<2.35). Finally, the ratio between elytral length and pronotum width was higher in *T. piniperda* (>1.9) than *T. destruens* (<1.9)" (Faccoli, 2006).

Biology and Ecology

Tomicus species are univoltine and have two dispersal phases per generation; the first is for maturation feeding on canopies of healthy pines and the other is for breeding on trunks of dying pines (Faccoli et al., 2007). Until recently, *Tomicus piniperda* and *T. destruens* were considered synonymous. Because of this and the fact that a portion of their natural ranges overlap, the two species are sometimes confused with each other in earlier literature.

Females colonize the inner bark and lay eggs singly along galleries which are parallel to the wood grain (Faccoli et al., 2005; Ciesla, 2003). Egg galleries are 10 to 25 cm (approx. 3 $^{15}/_{16}$ to 9 $^{13}/_{16}$ in) long. Larvae create horizontal feeding galleries off the main gallery and range from 4 to 9 cm (approx. 1 $^{9}/_{16}$ to 3 $^{9}/_{16}$ in) (Ciesla, 2003).

Once larvae hatch, they begin feeding on the phloem and eventually pupate in the outer bark (Faccoli, 2007). Depending on temperature, larvae can develop within 7 to 8 weeks (Faccoli et al., 2005).

After pupation, adults emerge in early summer and fly to healthy hosts to undergo maturation feeding and then overwinter. Development from egg to adult takes approximately 12 weeks. This species usually has one generation per year (Faccoli et al., 2005) although other papers report two to three overlapping generations per year (reviewed in Ciesla, 2003, Nanni and Tiberi,

1997). The generation could actually be multiple broods from females attacking more than one tree since the existing data does not take maturation feeding into account (Ciesla, 2003).

Re-emergence to attack other trees is common with bark and ambrosia beetles; this results in sister flights. Adults are oligophagous and begin to emerge in the spring where they locate healthy pines to tunnel into shoots where they become sexually mature (Faccoli, 2007). In Italy, flight period is concentrated within a few weeks in spring (Faccoli et al., 2005) with adults capable of flying at least 2 km (1.24 miles) (Ciesla, 2003). *T. destruens* will continue to maturation feed until early autumn (Faccoli et al., 2005). Oviposition occurs in the fall (Ciesla, 2003).

Adults then overwinter with most overwintering in the pine shoots of healthy hosts (Faccoli et al., 2005) although all stages can overwinter (Ciesla, 2003). *Tomicus destruens* uses volatiles to locate stressed, dying or cut trees where they can lay their eggs in autumn (Faccoli, 2007; Faccoli et al., 2005).

Countries of Origin

T. destruens is native to the Mediterranean region (Gallego et al., 2008).

Current Distribution

T. destruens is currently distributed in Algeria, Croatia, Cyprus, Greece, Israel, Italy, Lebanon, Madeira, Morocco, Portugal, Spain, Tunisia, Turkey (USDA-APHIS, 2010).

Distribution in United States

According to NAPIS survey data, this pest has not been found in the United States from 2006-2008 (K. Handy, personal communication, 2009).

Pathway

There have been no recorded interceptions of *T. destruens* at U.S. ports of entry. However, between 1985 and 2000, *T. piniperda* has been intercepted 155 times (Ciesla, 2003). Due to the difficulty of distinguishing between the two species, some interceptions from areas where *T. destruens* is found may be this species (Ciesla, 2003). 60% of interceptions occurred on dunnage, 29% on crating and less than 1% on pallets (Haack, 2001).

Pathogens Vectored

Blue stain can be found in the xylem accompanying breeding attacks (Ciesla, 2003). Several other potentially pathogenic fungi are associated with *T. destruens* including: *Heterobasidion annosum*, *Leptographium guttulatum*, *L. lundbergii*, *L. serpens*, *L. wingfieldii* and *Phellinus pini* (Nanni and Tiberi, 1997; Peverieri et al., 2006). *H. annosum* has been shown to be highly pathogenic (Viiri, 2004).

Damage

Feeding by adults can lead to dead shoots with tunnels and yellow to reddish-brown leaves; adults may also be found when examined (Ciesla, 2003). Reddish-brown boring dust can be found on the bark surface due to breeding attacks as well as pitch tubes on the bark surface if attacked trees are healthy (Ciesla, 2003). The egg gallery is vertical and 10-25 cm long with larval galleries branching off perpendicular to the egg gallery; larval feeding galleries are 4-9 cm long (Ciesla, 2003).

Damage characterized by *T. destruens* (William Ciesla, Forest Health Management International, Bugwood.org)

Survey

1.1 Survey Site Selection

Select sites with plantings or natural settings with *Pinus* species present, preferably near warehouses or other businesses that receive wood crating, pallets and dunnage from foreign sources. Follow the general instructions on **General Site Considerations for Trap Placement** in the manual section **Planning a Survey**.

1.2 Trap and Lure

The CAPS-approved survey method for *T. destruens* is ethanol and ultra-high release alpha-pinene in a multi-funnel trap. Ethanol is released by microorganisms in decaying woody tissue and is used by insects to locate stressed trees (Byers, 1992). Alpha-pinene is a host volatile released by pine trees. It is a generic attractant for many pine-attacking wood-borers and bark beetles.

The release rates of these lure are highly temperature-dependent. However, CAPS has listed a conservative length of effectiveness (8 weeks for both lures) that will be effective for even the warmest climates in the CAPS community.

IPHIS Survey Supply Ordering System Product Names:

1) Alpha Pinene UHR Lure

2) Ethanol Lure
3) Multi-funnel Trap, 12 Funnel, Wet or
4) Multi-funnel Trap, 8 Funnel, Wet

There are two alpha pinene products available in the IPHIS Survey Supply Ordering System: 1) Alpha Pinene Lure and 2) Alpha Pinene UHR Lure. The Alpha Pinene Lure is an un-gelled lure in a bottle dispenser that is used by the PPQ Program for *Tomicus piniperda* (pine shoot beetle). This lure should only be used for the program survey.

The Alpha Pinene UHR Lure is a polysleeve, ultra-high release dispenser used for other EWB/BB targets. This lure should be used with the Ethanol Lure for the following two EWB/BB targets: *Monochamus alternatus* and *Tomicus destruens*.

1.3 Trap Placement

Follow the general instructions on **Trap Placement** and **Trap Setup** for multi-funnel traps in the manual section **Conducting a Survey**.

1.4 Time of year to survey

In central Italy, adults attack hosts from February to May with peak activity during April and May (Ciesla, 2003). This species can have overlapping generations throughout the year. Ciesla (2003) reports that first generation adults emerge in early summer. Oviposition occurs in August and usually ends by the beginning of winter (Ciesla, 2003).

Identification

CAPS-Approved Method

Morphological. Examination by a taxonomist with expertise in the weevil subfamily Scolytinae is required for identification. Examine specimens under a microscope with 70-110X magnifications and gooseneck lighting sources.

1. To determine if the specimen is *Tomicus*, use Passoa and Cavey (1994) followed by Brodel (2005--rev. 2009)

2. To determine the species of *Tomicus (destruens, minor, or piniperda),* use Brodel (2005--rev. 2009) with Brodel (2000).

Mistaken Identities

T. destruens can be mistaken for other families and genera of small beetles with the naked eye. Upon magnification, *T. destruens* can be mistaken for other Scolytinae and *Tomicus,* including *Tomicus minor* and *T. piniperda. T. piniperda,* has been found in at least 17 states in the Northeast and Midwest United States and is a PPQ program pest. *T. minor* has not been reported in the United States.

Resources and High Resolution Images

More information available at: Pine Commodity Reference p. 113 – 123.

Screening Aids

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Passoa, S. and J. Cavey. 1994. Key to help screen *Tomicus piniperda* (L.) from other North American Scolytidae (Coleoptera). USDA, APHIS, PPQ. NA-TP-06-93 http://www.barkbeetles.org/exotic/tmcspnpe.html.

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reforestation pests. USDA-APHIS General Technical Report NE- 236. Edited by J. C. Grégoire, A. M. Liebhold, F. M. Stephen, K. R. Day and S. M. Salom.

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