Ips sexdentatus (Boerner)

Coleoptera: Curculionidae

Six-toothed Ips

Host(s)	CAPS-Approved Survey Method
Major/Primary hosts *Pinus brutia* (Calabrian pine)**,** *Pinus heldreichii* (Heldreich pine), *Pinus nigra* (Austrian pine), *Pinus pinaster* (Maritime pine), *Pinus sylvestris* (Scots pine), *Pinus taiwanensis* (Taiwan pine) In Thailand, *P. merkusii* and *P. caribaea* are hosts **Minor hosts** *Picea orientalis* (Oriental spruce), *Pinus* spp. (pine), *Pinus armandii* (Armand pine), *Pinus heldreichii* (Bosnian pine), *Pinus nigra* (Austrian pine), *Pinus pinaster* (Maritime pine), *Pinus sibirica* (Siberian stone pine), **Wild hosts** *Abies nordmanniana* (Nordmann fir), *Picea asperata* (Dragon spruce), *Picea orientalis* (Oriental spruce), *Pinus armandii* (Armand pine), *Pinus kesiya* (Khasya pine), *Pinus koraiensis* (Fruit pine), *Pinus tabuliformis* (Chinese pine), *Pinus yunnanensis* (Yunnan pine) **Other hosts** *Abies* spp. (Fir), *Abies alba* (Fir, Silver), *Larix* spp. (Larch), *Larix decidua* (European larch), *Larix sibirica* (Russian larch), *Picea* spp. (Spruce), *Picea abies* (Norway spruce), *Pinus pinea* (Pine, Italian Stone), *Pinus radiata* (Pine, Radiata), *Pseudotsuga menziesii* (Douglas-fir) (Ciesla, 2001; EPPO, 2007; CABI, 2010)	EBB/ *Ips* lure: cis-verbenol, ipsdienol and 2-methyl-3-buten-2-ol lures in multi-funnel trap.

Reason for Inclusion in Manual

Ips sexdentatus was a target species in the original EWB/BB National Survey Manual.

Pest Description

Ips sexdentatus is the largest beetle in the *Ips* genus (EPPO, n.d.). Adults are 5.5 to 8.2 mm [approx. $^{3}/_{16}$ to $^{5}/_{16}$ in] in length (Cavey et al., 1994). "The species is named for the six spines or teeth found on each lateral margin of the elytral declivity" (Cavey et al., 1994). Adults are brown, with an "excavated elytral declivity armed laterally with spines" (Cavey et al., 1994). When "viewed from above, erect yellow hairs protrude from the body perimeter" (Cavey et al., 1994). "Both sexes have six spines at each side of the elytral declivity. The fourth is the largest and is capitate. Only the female has a longitudinal stridulatory organ on the upper hind part of the head" (EPPO, n.d.).

Image: Adult *Ips sexdentatus* (Steve Passoa, USDA APHIS PPQ, Bugwood.org)

Image: Adult *Ips sexdentatus* (Pest and Diseases Image Library, Bugwood.org)

Biology and Ecology

There are typically two generations per year with adults flying from April to May and July to August. Sometimes there can be three generations in the Mediterranean regions of Europe (Ciesla, 2001).

I. sexdentatus prefers large trees with thick bark. Males initiate attacks by constructing a nuptial chamber under the bark. Two to five females will join and mate with the male. After mating, the females will construct longitudinal egg galleries, depositing each egg into individual niches on both sides of the gallery (Ciesla, 2001).

When larvae hatch, they will feed in galleries perpendicular to the egg gallery. Pupation occurs at the end of each larval gallery in round chambers. Maturation feeding is required for sexual maturity (Ciesla, 2001).

Countries of Origin
According to FAO (2007) this pest is native throughout Asia and Europe.

Current Distribution
This species is present in: Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, China, Corsica, Croatia, Czech Republic, Korea, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Japan, Latvia, Lithuania, Luxembourg, Macedonia, Moldova, Mongolia, Montenegro, Myanmar, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Sardinia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, and the United Kingdom (Ciesla, 2001; CABI, 2003; Alonzo-Zarazaga, 2004).

Distribution in United States
Haack (2001) reports that *I. sexdentatus* has been intercepted in the United States 157 times since 1985.

According to survey data reported in NAPIS, *I. sexdentatus* has not been found in the United States.

Pathway
According to AQAS records, most interceptions have occurred in general cargo, but have also been found on holds, mail, permit cargo, and stores (AQAS, accessed October 10, 2009). Almost all interceptions have occurred on wood products, including dunnage and crating (AQAS, accessed October 10, 2009).

Potential pathways for all life stages include "unprocessed logs, wood products, wooden packing materials, dunnage or pallets containing bark strips" (EPPO, n.d.).

Pathogens Vectored
I. sexdentatus is a vector of the blue stain fungus (*Ophiostoma brunneo-ciliatum*) (EPPO, n.d.; Lieutier et al., 1989).

Damage
From "Exotic Forest Pest Information System for North America" (Ciesla, 2001):

> "The first indication of attack by *Ips sexdentatus* is that infested trees fade from green to yellow to reddish brown. Breeding attacks are characterized by the presence of reddish-brown boring dust on the bark surface of trees, freshly cut logs or windthrow. If relatively vigorous trees are attacked, pitch tubes are found in bark crevasses. The gallery pattern in the cambial region of infested trees consists of a nuptial chamber and two to five longitudinal egg galleries ca 15 to 35 cm [approx. 5 $^{7}/_{8}$ to 13 $^{3}/_{4}$ in] long. Breeding attacks are accompanied by blue stain in the woody tissue (Abgrall and Soutrenon 1991). Round exit holes, ca 4 mm [approx. $^{3}/_{16}$ in] in diameter can be seen on the bark surface of trees where this insect has completed its life cycle and adults have emerged."

Ips sexdentatus adult under bark of larch (Vladimir Petko, V.N. Sukachev Institute of Forest SB RAS, Bugwood.org)

Ips sexdentatus galleries, central way of gallery is slightly engraved in sapwood; scale: large quadrate 1 x 1 cm, small one 1 x 1 mm (Hannes Lemme, Bugwood.org)

From "Data Sheets on Quarantine Pests: *Ips sexdentatus*" (EPPO, n.d.):

> "The gallery system has two to four female galleries up to about 1 m [<$^{1}/_{16}$ in] in length, half of them in each of two opposite directions. Larval galleries are 8-10 cm [approx. 3 $^{1}/_{8}$ to 3 $^{15}/_{16}$ in] long. The wood under the gallery is stained blue from fungi transferred by the beetles (Chararas, 1962)."

Ips sexdentatus gallery (Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org)

Ips sexdentatus pitch tube on Austrian pine (Maja Jurc, University of Ljubljana, Bugwood.org.)

Survey

1.1 Survey Site Selection

Identify known or prospective hosts of *Ips sexdentatus* and follow the general instructions on **General Site Considerations for Trap Placement** in the manual section **Planning a Survey**. *I. sexdentatus* has been reported to preferentially attack "large trees with thick bark" (Ciesla, 2001).

1.2 Trap and Lure

The CAPS-approved survey method for *I. sexdentatus* is the Exotic Bark Beetle (EBB)/ *Ips* lure in a multi-funnel trap (Serez, 1987). The EBB/ *Ips* lure is the synthetic aggregation pheromone for *Ips typographus*. The lure contains the following three components: 1) cis-verbenol, 2) ipsdienol, 3) 2-Methyl-3-buten-2-ol (MBO).

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

IPHIS Survey Supply Ordering System Product Names:

1) *Ips* sp. Lure, 3 Dispenser
2) Multi-funnel Trap, 12 Funnel, Wet or
3) Multi-funnel Trap, 8 Funnel, Wet

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

From "Data Sheets on Quarantine Pests: *Ips sexdentatus*" (EPPO, n.d.):

> *Ips sexdentatus* has "two generations in central areas of Eurasia and four to five generations in the Mediterranean area and in other areas with a long, warm summer season. The spring flight starts when the temperature exceeds about 20°C [68°F]; in the north this is in May/June, in southern areas in March/April."

Identification

CAPS-Approved Method

Morphological: Examine specimens under a good quality, high powered (preferably with up to 90X) dissecting microscope, with the help of a reference collection. Use the screening aid(s) for the relevant geographical area.

Mistaken Identities

With the naked eye, *I. sexdentatus* could be confused with other families of small beetles. Upon magnification, *I. sexdentatus* could be confused with other scolytids, *Acanthotomicus* species, or *Orthotomicus* species.

Resources and High Resolution Images

Images

http://www.forestryimages.org/browse/subthumb.cfm?sub=887&Start=1&display=60&sort=2

http://www.eppo.org/QUARANTINE/insects/Ips_sexdentatus/IPSXSE_images.htm

Screening Aids

Cavey, J., Passoa, S. and Kucera D. 1994, Screening Aids for Exotic Bark Beetles in the Northeastern United States. NA-TP-11-94. Northeastern Area: U.S. Department of Agriculture, Forest Service.
http://caps.ceris.purdue.edu/screening/exotic_bark_beetles_of_northeast.

References

Alonzo-Zarazaga, M. A. 2004. Fauna Europaea: *Ips sexdentatus*. Fauna Europaea version 2.4, http://www.faunaeur.org

AQAS. 2009. Interception data for *Ips sexdentatus*. Accessed October 9, 2009 from: https://mokcs14.aphis.usda.gov/aqas/HomePageInit.do.

CABI. 2010. Datasheets: *Ips sexdentatus* (six-toothed bark beetle). Crop Protection Compendium, CABI. Accessed May 23, 2011, from: http://www.cabi.org/cpc.

CABI. 2003. *Ips sexdentatus* [Distribution Map] (Map 648). Distribution Maps of Plant pests. CAB International.

Ciesla, W. M. 2001. Exotic Forest Pest Information System for North America: *Ips sexdentatus*. North American Forestry Commission.

EPPO. 2007. EPPO Plant Quarantine Information Retrieval System (PQR), version 4.6. European and Mediterranean Plant Protection Organization.

EPPO. No date. Data Sheets on Quarantine Pests: *Ips sexdentatus*. European and Mediterranean Plant Protection Organization. 3 pp.

FAO. 2007. Forest Pest Species Profile: *Ips sexdentatus*. Food and Agriculture Organization of the United Nations, Forestry.

Haack, R.A. 2001. Intercepted Scolytidae (Coleoptera) at US ports of entry: 1985-2000. Integrated Pest Management Reviews 6: 253-282.

Lieutier, F., C. Cheniclet, J. Garcia. 1989. Comparison of the defense reactions of *Pinus pinaster* and *Pinus sylvestris* to attacks by two bark beetles (Coleoptera: Scolytidae) and their associated fungi. Environmental-Entomology 18: 228-234.

Serez, M. 1987. Use of the aggregation pheromone preparation 'Ipslure' against the Mediterranean pine bark-beetle Ips (Orthotomicus) erosus (Woll.) (Col., Scolytidae). [Verwendung des Aggregationspheromon-Praparats 'Ipslure' gegen den mediterranen Kiefernborkenkafer, Ips (Orthotomicus) erosus (Woll.) (Col., Scolytidae).] Anzeiger fur Schadlingskunde, Pflanzenschutz, Umweltschutz 60(5): 94-95.