Pityogenes chalcographus (Linnaeus)

Coleoptera: Curculionidae

Spruce Engraver, Six-toothed spruce bark beetle

Host(s)	CAPS-Approved Survey Method
Major/Primary hosts *Picea* spp. (Spruce), *Picea abies* (Norway spruce), *Picea glehnii* (Sakhalin spruce), *Picea jezoensis* (Yeddo spruce), *Picea obovata* (Spruce of Siberia), *Picea omorika* (Pancic spruce), *Picea orientalis* (Oriental spruce), *Picea sitchensis* (Sitka spruce) **Other hosts** *Abies spp.* (Fir), *Abies alba* (Silver fir), *Juniperus communis* (Common juniper), *Larix* spp. (Larch), *Larix decidua* (Common larch), *Larix gmelinii* (Dahurian larch), *Larix sibirica* (Siberian larch), *Pinus* spp. (Pine), *Pinus banksiana* (Jack pine), *Pinus cembra* (Arolla pine), *Pinus densiflora* (Japanese umbrella pine), *Pinus koraiensis* (Fruit pine), *Pinus mugo* (Mountain pine), *Pinus parviflora* var. *pentaphylla*, *Pinus peuce* (Macedonian pine), *Pinus pumila* (Dwarf Siberian pine), *Pinus sibirica* (Siberian stone pine), *Pinus strobus* (Eastern white pine), *Pinus sylvestris* (Scots pine), *Pinus uncinata* (Mountain pine), *Pseudotsuga menziesii* (Douglas-fir) (Csóka and Kovács, 1999; CABI, 2011)	A three-component lure: 1) Chalcogran, 2) Methyl-2,4-decadienoate, 3) 2-methyl-3-buten-2-ol) in a multi-funnel trap.

Reason for Inclusion in Manual

Pityogenes chalcographus was a target species in the original EWB/BB National Survey Manual.

Pest Description

Adults:

Pityogenes chalcographus is a small species, 1.6-2.9 mm (approx. $^{1}/_{16}$ to $^{1}/_{8}$ in), with a moderately excavated elytral declivity bearing 3 conical teeth (males) or 3 smaller teeth (females) (Cavey et al., 1994). Adults are shiny and elongated (Kolk and Starzyk, 1996). Color is black or bicolored, with black in front and red-brown on the latter half (Cavey et al., 1994).

Adult *Pityogenes chalcographus*. (John Beyers, USDA-APHIS).

P. chalcographus adult (Maja Jurc, University of Ljubljana, Bugwood.org)

P. chalcographus adult (Maja Jurc, University of Ljubljana, Bugwood.org)

Biology and Ecology

This species overwinters as an adult and occasionally as a larva or pupa. *P. chalcographus* has one to two generations per year, depending on the weather (Kolk and Starzyk, 1996).

First generation adults fly from April to May, while second generation adults fly from July to August (Kolk and Starzyk, 1996). Mating occurs mainly in cut branchwood, although it may also occur in the stems and crowns of weakend trees (Browne, 1968).

The species is polygamous (Browne, 1968). After the nuptial chamber is completed and mating has occurred, 3 to 8 egg galleries are formed leading off of the nuptial chamber. This can give the feeding chambers a star shape. Egg galleries can be up to 6 cm (approx. 2 $^{3}/_{8}$ in) long and 1 mm ($<^{1}/_{16}$ in) wide while larval galleries can be 2 to 4 mm (approx. $^{1}/_{16}$ to $^{3}/_{16}$ in) long. The full gallery consists of a central nuptial chamber (inhabited by the male), 2 to 6 egg galleries

(inhabited by the females), and individuals short, and separated larval galleries which each end in a pupal chamber (Browne, 1968). Mature larvae can pupate in the sapwood (when bark is thin) or in the phloem (when bark is thick). Maturation feeding is required for sexual maturity (Kolk and Starzyk, 1996).

Countries of Origin

According to the CABI (2011) this species is native to: Austria, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Japan, Korea, Latvia, Lithuania, Macedonia, Mongolia, the Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Turkey, and Ukraine.

Current Distribution

This species is present in: Algeria, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Macedonia, Moldova, Mongolia, the Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and Ukraine (Alonzo-Zarazaga, 2004; CABI, 2011).

This species has been intercepted in Canada, Jamaica, Puerto Rico, and the United States (CABI, 2011).

Distribution in United States

Haack (2001) states that *Pityogenes chalcographus* has been intercepted in Georgia, Kentucky, Louisiana, New York, and Texas. *P. chalcographus* is not known to be established in the United States (Baez, 2008).

Maryland reported positive data in 2007 but has not surveyed since (K. Handy, personal communication, 2009). According to NAPIS survey data, no other state besides Maryland has reported positive data (K. Handy, personal communication, 2009).

Pathway

P. chalcographus has been intercepted hundreds of times in the United States. Most interceptions occurred in general cargo but also occurred in baggage, holds and mail (AQAS, accessed October 10, 2009). Almost all interceptions occurred on wood products including solid wood packing material, dunnage, and pallets (AQAS, accessed October 10, 2009).

Pathogens Vectored

From "NPAG Report: *Pityogenes chalcographus* Linnaeus: Sixtoothed Spruce Bark Beetle" (Baez, 2008):

> *"Pityogenes chalcographus* is intimately associated with blue-stain fungi (Ophiostomatales: Ophiostomataceae) (CABI, 2007). The blue-stain fungi associated with *P. chalcographus* are ***Ceratocystiopsis minuta***, *Ceratocystis polonica*, ***Graphium fimbriisporum***, ***G. pseudormiticum, Leptographium* sp., *Ophiostoma ainoae***, *O. araucariae*, ***O bicolor,*** *O. cucullatum, O. floccosum, O. neglectum, O. penicillatum,* ***O. piceae***, *O. piceaperdum, O. serpens, O. stenoceras,* ***Pesotum* sp.** (fungal species in bold are commonly associated with *P. chalcographus*) (Kirisits, 2004)."

Damage

From "Smaller European spruce bark beetle - Pityogenes chalcographus L." (Kolk and Starzyk, 1996):

> *"P. chalcographus* is one of the most dangerous pests of Norway spruce. This species is of a high importance in young stands weakened by defoliators, where it can occur and cause damage itself. At high density population, it attacks also healthy trees, therefore preparing the breeding material for *I. typographus*. It can infest small-sized timber and windthrows."

Gallery damage (Maja Jurc, University of Ljubljana, Bugwood.org)

Survey

1.1 Survey Site Selection

Identify known or prospective hosts of *P. chalcographus* and follow the general instructions on **General Site Considerations for Trap Placement** in the manual section **Planning a Survey**.

P. chalcographus "prefers the thin barked parts of the stem, and is therefore most common on younger trees or on the upper parts of older trees" (Walker, 2007). *P. chalcographus* "prefers sites only slightly exposed to the sunshine" (Kolk and Starzyk, 1996).

1.2 Trap and Lure

The CAPS-approved survey method for *Pityogenes chalcographus* is a three-component lure (1) Chalcogran, (2) Methyl-2,4-decadienoate, and (3) 2-methyl-3-buten-2-ol) in a multi-funnel trap (Byers et al., 1998; Byers et al., 1990).

Chalcogran and methyl-2,4-decadienoate are two male-produced pheromones emitted by *Pityogenes chalcographus* (Byers et al., 1998; Byers et al., 1990). This combination is used by

the insect to cause an aggregation response. The 2-methyl-3-buten-2-ol is a major volatile found in pine trees and is an attractant for other similar bark beetle species.

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) *Pityogenes chalcographus* Lure
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**. Kolk and Starzyk (1996) recommend placing traps in sunny areas at the edge of the forest and hanging traps as high as possible.

1.4 Time of year to survey

In southwestern Slovenia, *P. chalcographus* has two main generations per year and may also produce two sister generations (Jurc et al., 2006). In Slovenia, surveys occur from mid-April through early September (Jurc et al., 2006). Peak trap catches for the winter generation occurred in early June and in early July for the summer generation (Jurc et al., 2006).

Identification

CAPS-Approved Method:

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

Mistaken Identities:

P. chalcographus can be mistaken for other families of small beetles with the naked eye as well as other Scolytinae, *Orthotomicus* spp., *Pityogenes* spp., and *Pityokteines* spp. In the northeastern United States, it may be mistaken for *Pityogenes bidentatus* or *Pityogenes hopkinsi*.

Resources and High Resolution Images

Images

http://www.forestryimages.org/browse/subthumb.cfm?sub=4147&Start=1&display=60&sort=2

Screening aids

Cavey, J., S. Passoa, and D. Kucera. 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: *Pityogenes chalcographus*. Fauna Europaea version 2.4, http://www.faunaeur.org.

AQAS. 2009. Interception data for *Pityogenes chalcographus*. Accessed October 10, 2009 from: https://mokcs14.aphis.usda.gov/aqas/HomePageInit.do

Baez, I. 2008. NPAG Report: *Pityogenes chalcographus* Linnaeus, Sixtoothed Spruce Bark Beetle. United States Department of Agriculture, Animal and Plant Health Inspection Service, Center for Plant Health Science & Technology, Plant Epidemiology and Risk Analysis Laboratory, New Pest Advisory Group.

Browne, F. G. 1968. Pests and Diseases of Forest Plantation Trees: An annotated list of the principal species occurring in the British Commonwealth. Clarendon Press, Oxford.

Byers, J. A., G. Birgersson, J. Löfqvist, M. Appelgren, and G. Bergström. 1990. Isolation of pheromone synergists of bark beetle, Pityogenes chalcographus, from complex insect-plant odors by fractionation and subtractive-combination bioassay. Journal of Chemical Ecology 16(3): 861-876.

Byers, J. A., Zhang QingHe, F. Schlyter, G. Birgersson, and Q. H. Zhang. 1998. Volatiles from non host birch trees inhibit pheromone response in spruce bark beetles. Naturwissenschaften. 85: 11, 557-561.

CABI. 2011. *Pityogenes chalcographus*. Crop Protection Compendium. Accessed May 23, 2011 from: http://www.cabi.org/cpc.

Csóka, G., and T. Kovács. 1999. Xilofág rovarok- Xylophagous insects. Hungarian Forest Research Institute. Erdészeti Turományos Intézet, Agroinform Kiadó, Budapest. 189 pp. Accessed May 23, 2011 from: http://www.forestpests.org/hungary/weevilspc.html.

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

Handy, K. J. 2009. NAPIS data for EWB/BB target species. Personal communication (email) to L. Jackson on 23 March 2009, from KJ Handy (USDA-APHIS-PPQ-EDP).

Jurc, M., M. Perko, S. Džeroski, D. Demšar, and B. Hrašovec. 2006. Spruce bark beetles (*Ips typographus*, *Pityogenes chalcographus*, Col: Scolytidae) in the Dinaric mountain forests of Slovenia: Monitoring and modeling. Ecological Modeling. 194: 219-226.

Kolk, A. and J.R. Starzyk. 1996. The Atlas of Forest Insect Pests (Atlas skodliwych owadów lesnych) - Multico Warszawa, 705 pages. Original publication in Polish. English translation provided by Dr. Lidia Sukovata and others under agreement with The Polish Forest Research Institute.

Walker, K. 2007. Six-toothed spruce bark beetle *(Pityogenes chalcographus)* Pest and Diseases Image Library. Updated on 23/06/2007. http://www.padil.gov.au.