

Ips typographus (Linnaeus)

Coleoptera: Curculionidae

European Spruce Bark Beetle

Host(s)	CAPS-Approved Survey Method
<p>Major/Primary hosts <i>Picea</i> spp. (Spruce), <i>Picea abies</i> (Norway spruce), <i>Picea jezoensis</i> (Yeddo spruce), <i>Picea obovata</i> (Spruce of Siberia), <i>Picea orientalis</i> (Oriental spruce),</p> <p>Minor hosts <i>Abies</i> spp. (Fir), <i>Larix</i> spp. (Larch), <i>Picea</i> spp. (Spruce), <i>Pinus</i> spp. (Pine), <i>Pinus sylvestris</i> (Scots pine), <i>Picea sitchensis</i> (Sitka spruce),</p> <p>(USDA, 1985; Kolk and Starzyk, 1996; Eglitis, 2006)</p>	<p>EBB/ <i>Ips</i> lure: cis-verbenol, ipsdienol and 2-methyl-3-buten-2-ol lures in multi-funnel trap.</p>

Reason for Inclusion in Manual

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



I. typographus adult (Pest and Diseases Image Library, Bugwood.org)



I. typographus adult. Four spines on each side of elytral declivity (Pest and Diseases Image Library, Bugwood.org)

Pest Description

Ips typographus is a “moderate to large (4.2-5.5 mm [approx. $\frac{3}{16}$ to $\frac{1}{4}$ in]), cylindrical, brown bark beetle” with “an excavated elytral declivity armed laterally with 4 spines on each side from above, erect yellow hairs protrude from the body perimeter and margins of the declivity” (Cavey et al., 1994). “The head is covered by a thoracic shield and is not visible when viewed dorsally” (Eglitis, 2006). “The declivity is concave, with each side having armed by a four distinct spines” (Eglitis, 2006).

Biology and Ecology

This species has one to two generations per year depending on weather conditions. Adults from the first generation are active from April to May; the second generation is active from July to August. After females mate, they will tunnel vertical egg galleries off of the nuptial chamber, laying an egg every 2 mm (approx. $\frac{1}{16}$ in) (Kolk and Starzyk, 1996).

After hatching, larvae will feed, chewing galleries horizontally. Feeding lasts 3 to 4 weeks before pupation occurs in a pupal chamber in the bark (Kolk and Starzyk, 1996).

Maturation feeding is required for sexual maturity. This occurs under the bark where it forms characteristic horn-like tunnels which are visible in the wood. Adults overwinter either in the leaf litter or under bark (Kolk and Starzyk, 1996).

Countries of Origin

This species is most likely native to the area where its preferred host, *Picea abies* (Norway spruce) is found which is throughout most of Europe.

Current Distribution

This species is present in: Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, the Netherlands, Norway, Poland, Romania, Russia, Sakhalin Islands, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Tajikistan, Turkey, and Ukraine (Novák, 1976; USDA, 1985; Alonzo-Zarazaga, 2004; Eglitis, 2006; EPPO, 2007).

Distribution in United States

According to survey data in NAPIS, *I. typographus* was found in Indiana in 1995 but has not been found since in later surveys (K. Handy, personal communication, 2009).

Maryland also reported positive NAPIS survey data in 2002, but from 2003-2007 NAPIS survey data was negative for this pest (K. Handy, personal communication, 2009).

Pathway

According to AQAS records, most interceptions occurred on general cargo, but some also occurred on baggage, holds, mail and permit cargo (AQAS, accessed October 10, 2009). Almost all specified interceptions occurred on wood products such as crating, dunnage, and wood (AQAS, accessed October 10, 2009).

Pathogens Vectored

There are a number of pathogens associated with *I. typographus*, including: *Gregarina typographi* (Sporozoa, Eugregarinida), *Chytridiopsis typographi* (Sporozoa, Microspora), *Unikaryon montanum* (Sporozoa, Microspora), and *Menzbieria chalcographi* (Sporozoa, Neogregarinida) (Wegensteiner and Weiser, 2004).

A number of blue-stain fungi have been associated with *I. typographus* in the genera *Ceratocystis*, *Graphium*, and *Ophiostoma* (Johnson, 2002; Krokene and Solheim, 1997). The fungus *Ophiostoma polonicum* is “highly virulent and capable of killing the host by itself” (Eglitis, 2006). *Ceratocystis polonica* “is the most important fungal associate of *Ips typographus*,” with 35 to 94% of the beetles carrying the fungus in Norway (Krokene and Solheim, 1997). *O. piceae*, “a common sap stain fungus of lumber in both Europe and North America,” has been isolated from 31% of *I. typographus* in Norway (Krokene and Solheim, 1997).

Damage

From “Exotic Forest Pest Information System for North America: *Ips typographus*” (Eglitis, 2006):

“The most conspicuous indication of attack by *Ips typographus* is that the foliage of infested trees fades 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. Breeding attacks are accompanied by blue stain in the woody tissue (Abgrall and Soutrenon, 1991).

Round exit holes can be seen on the bark surface of trees where this insect has completed its life cycle and adults have emerged.”

From “European spruce bark beetle - *Ips typographus* L.” (Kolk and Starzyk, 1996):

“*I. typographus*] infests mainly lower and middle parts of stems. Living trees are killed as soon as cambium is destroyed by larvae. Sometimes trees with green crowns can be without the bark because of larval and woodpecker activity.”

From “Data sheets on quarantine pests: *Ips typographus*” (EPPO, n.d.):

“Usually three but sometimes also two or four female galleries run from a nuptial chamber under the bark of spruce. Length may vary with gallery density, but 10-12 cm [approx. $3 \frac{15}{16}$ to $4 \frac{3}{4}$] is an average length.”



I. typographus galleries (Louis-Michel Nageleisen, Département de la Santé des Forêts, Bugwood.org)



I. typographus galleries (Milan Zubrik, Forest Research Institute- Slovakia, Bugwood.org)



I. typographus adult and boring dust on bark (Daniela Lupastean, University of Suceava, Bugwood.org)



I. typographus damage (Milan Zubrik, Forest Research Institute- Slovakia, Bugwood.org)

Survey

1.1 Survey Site Selection

Identify known or prospective hosts of *Ips typographus* and 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 *I. typographus* is the Exotic Bark Beetle (EBB)/ *Ips* lure in a multi-funnel trap (Bakke et al., 1977). 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.

IPHS 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

Adult flight occurs when the air temperature rises to about 20°C (68°F) (Annala, 1969). In southern Norway, Bakke et al. (1977) reported initial beetle flight in early May, with peak flight recorded in mid-May through mid-June. Smaller numbers of beetles were caught in July and August (Bakke et al., 1977). Annala (1969) reported adult emergence from overwintering sites from late May through late June in south Finland, starting when temperatures ranged from 17 to 19.5°C (63 to 67°F). Beetles were most numerous at temperatures of 25 to 26°C (77 to 79°F) (Annala, 1969).

In Slovenia, *I. typographus* is reported to have two main generations and may also have two sister generations (Jurc et al., 2006). In Slovenia, the first peak in trap catches occurred between mid-May and early June, corresponding to the emergence of the winter generation (Jurc et al., 2006). The second peak occurred between early June and late August, corresponding with the emergence of 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 a reference collection. Use the screening aid(s) for the relevant geographical area.

Mistaken Identities

With the naked eye, *I. typographus* could be confused with other families of small beetles. Upon magnification, *I. typographus* could be confused with other scolytids and other *Ips* species having 4 teeth on the elytral declivity (Cavey et al., 1994). In the Northeastern United States, commonly confused species include: *Ips avulsus*, *Ips perroti*, *Ips perturbatus*, *Ips pini*, and *Ips plastographus* (Cavey et al., 1994).

Resources and High Resolution Images

Images

<http://www.forestryimages.org/browse/subthumb.cfm?sub=888&Start=1&display=60&sort=2>.

<http://www.chemical-ecology.net/insects/ipst.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://www.barkbeetles.org/exotic/htypgrph.html>

References

- Alonzo-Zarazaga, M. A. 2004.** Fauna Europaea: *Ips sexdentatus*. Fauna Europaea version 2.4, <http://www.faunaeur.org>
- Annala, E. 1969.** Influence of temperature upon the development and voltinism of *Ips typographus* L. (Coleoptera: Scolytidae). Annales Zoologica Fennica 6: 161-207.
- AQAS. 2009.** Interception data for *Ips sexdentatus*. Accessed November 13, 2009 from: <https://moks14.aphis.usda.gov/aqas/HomePageInit.do>
- Bakke, A., Ö. Austarå, and H. Pettersen. 1977.** Seasonal flight activity and attack pattern of *Ips typographus* in Norway under epidemic conditions. Meddelelser fra Det Norske Skogforsöksvesen. 33: 253-268.
- Eglitis, A. 2006.** Exotic Forest Pest Information System for North America: *Ips typographus*. 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 typographus*. European and Mediterranean Plant Protection Organization. 5 pp.
- 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).

- Johnson, A. 2002.** NPAG et Report. *Ips typographus*: Spruce Bark Beetle (Coleoptera: Scolytidae). New Pest Advisory Group (NPAG). New Pest Advisory Group (NPAG). Plant Epidemiology and Risk Analysis Laboratory. Center for Plant Health Science & Technology.
- 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.
- Krokene, P. and H. Solheim. 1997.** Pathogenicity of four blue-stain fungi associated with aggressive and nonaggressive bark beetles. *Phytopathology*. 88: 39-44.
- Novák, V. 1976.** Atlas of Insects Harmful to Forest Trees. Volume I. Elsevier Scientific Publishing Company, Amsterdam, The Netherlands. 125 pp.
- USDA. 1985.** Pests Not Known to Occur in the United States or of Limited Distribution, No. 66: Spruce bark Beetle. K. Whittle and D. M. Anderson [preparers]. USDA-APHIS-PPQ.
- Wegensteiner, R. and J. Weiser. 2004.** Annual variation of pathogen occurrence and pathogen prevalence in *Ips typographus* (Coleoptera, Scolytidae) from the BOKU University Forest Demonstration Centre. *J Pest Sci.*77: 221–228.

Revisions

August 2016

- 1) NAPPFAST maps removed.