Dendroctonus micans (Kugelann)

Coleoptera: Curculionidae: Scolytinae

Great spruce bark beetle

Host(s)	CAPS-Approved Survey Method
Major/Primary hosts *Picea* spp. (Spruce), *Picea abies* (Norway spruce), *Picea alba* (Canadian spruce), *Picea asperata* (Dragon spruce), *Picea breweriana* (Brewer's spruce), *Picea crassifolia* (Qinghai spruce), *Picea engelmannii* (Engelmann spruce), *Picea glauca* (White spruce), *Picea jezoensis* (Yeddo spruce), *Picea mariana* (Black spruce), *Picea obovata* (Siberian spruce), *Picea omorika* (Serbian spruce), *Picea orientalis* (Oriental spruce), *Picea pungens* (Blue spruce), *Picea sitchensis* (Sitka spruce), **Other hosts** *Abies alba* (Silver fir), *Abies nordmanniana* (Nordmann fir), *Abies sibirica* (Siberian fir), *Larix decidua* (Common larch), *Pinus contorta* (Lodgepole pine), *Pinus nigra* (Black pine), *Pinus strobus* (Eastern white pine), *Pinus sylvestris* (Scots pine), *Pinus uncinata* (Mountain pine), *Pseudotsuga menziesii* (Douglas-fir), *Picea complanata* (Sargent spruce), *Picea koyamae* (Koyama spruce), *Picea retroflexa,* *Pinus mugo* (Swiss mountain pine), *Pinus sibirica* (Siberian pine), (Petersen, 1952; USDA, 1987; Great Britain Forestry Commission, 2002; Dominik, 2003; CABI, 2009)	Visual

Reason for Inclusion in Manual

Dendroctonus micans was added to the manual in 2010. *Dendroctonus micans* is a target pest on the FY2011 AHP Prioritized Pest List.

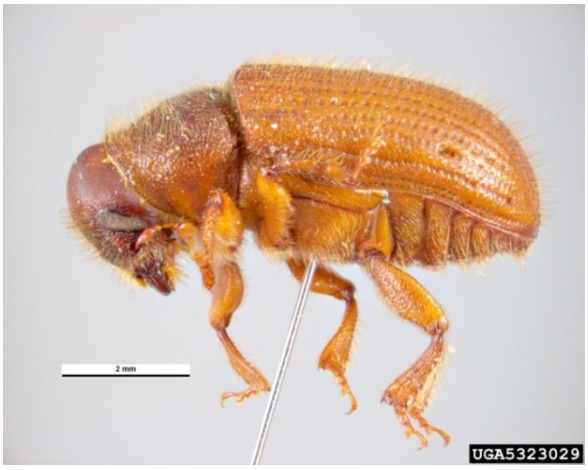
Pest Description

Adults:

From "Pests Not Known to Occur in the United States or of Limited Distribution (PNKTO), No. 81: European Spruce Beetle." (USDA, 1987):

> "Length about 6.0-8.0 mm [approx. $^{1}/_{4}$ to $^{5}/_{16}$ in] from apex of pronotum to apex of elytra, 2.33 times width (Wood 1963). Body dark brown when fully pigmented. Front of head convex; sparsely covered with fine, inconspicuous setae; deeply, coarsely punctate, without tubercles but with a few fine granules in females. Epistomal process flat, anterior margin with dense brush of yellowish setae. Antennae elbowed, funicle of 5 articles, club flattened. Pronotum slightly wider than long, weakly convex at sides, abruptly narrowed behind anterior margin; surface smooth, shining, punctures coarse, deep; setae moderately dense, fine and short medially, long and coarse laterally. Elytra 2.5 times as long as pronotum; sides subparallel on basal two-thirds, apex broadly rounded; basal margin bordered with row of raised crenulations; striae weakly impressed, with large, deep punctures. Declivity steep, convex, interstrial intervals bearing granules, which are minute in males, larger, larger in females. Elytra setae long, abundant, longest on declivity" (Whittle and Anderson, 1987).

Dendroctonus micans is light brown when immature and black when mature (Great Britain Forestry Commission, 2002).



Dendroctonus micans adult lateral view (Simon Hinkley & Ken Walker, Museum Victoria, Bugwood.org)

Dendroctonus micans adult, dorsal view. (Maja Jurc, University of Ljubljana, Bugwood.org).

Biology and Ecology

D. micans completes a generation in one to three years, primarily depending on temperature (reviewed in CAB, 2006). Grégoire and Merlin (1984) observed five instars, pre-pupal, pupal, and adult stages. Under natural conditions, larval development can take a year or more. However, under laboratory conditions larvae may reach maturity in 50-60 days at temperatures between 19-23°C (66 to 73°F) (Grégoire and Merlin, 1984). *Dendroctonus micans* overwinters in the larval or adult stage. Adult beetles freeze at -20°C (-4°F) (reviewed in CABI/EPPO, 1997). Adults are not known to survive freezing.

Adults mate before emerging. The male to female ratio ranges from about 1:10 to 1:45. Consequently, mating among siblings is common (reviewed in CAB, 2006). Approximately 90% of adult females emerge after mating with a sibling male within the gallery system where they developed (Vouland et al., 1984). The beetles construct round exit holes, which may be used by several individuals. Emergence may occur over 5 months depending on temperature and climate conditions (Vouland and Schvester, 1994; reviewed in CAB, 2006). Females initiate attacks on trees. A single mated female either re-enters an existing host or moves to a new host (reviewed in CABI/EPPO, 1997; reviewed in CAB, 2006). Females ordinarily attack standing, live trees, but may attack stressed trees as well (reviewed in Haack, 2001).

Flight occurs during warm temperatures in summer months (reviewed in CABI/EPPO, 1997). Vouland et al. (1984) reported a temperature threshold for adult flight between 21 to 23°C (70 to 73°F). In Britain, initial and sustained flights were observed at 20°C (68°F) and 14°C (57°F), respectively (reviewed in CAB, 2006). Adults are considered strong fliers and may disperse several km in search of suitable hosts. They may also be transported by wind. However, adults tend to repeatedly attack the tree from which they originally emerged or infest others nearby (reviewed in Haack, 2001). Flight may not be a common means of dispersal in shaded canopies (Fielding et al., 1991).

The female bores one or more horizontal galleries and deposits eggs in clusters of 100-150 inside a brood chamber containing a protective mixture of bark pieces, sawdust, and frass (Storer et al., 1997; Lieutier, 2004; reviewed in CAB, 2006). Eggs are deposited on one side of the chamber. Under laboratory conditions, a single female deposited 240 (±30.83) eggs on average within approximately one to three weeks. Approximately 52% of these individuals developed to adulthood (Grégoire and Merlin, 1984). When population density is high and multiple females deposit eggs within a single host, larval gallery systems can converge (reviewed in CAB, 2006).

Immediately following egg hatch, larvae aggregate in response to (-)-α-pinene and *trans*-verbenol and feed side-by-side in large groups (Grégoire et al., 1982; Deneubourg et al., 1990; Storer et al., 1997). Larvae primarily feed on phloem and periodically bore holes to the bark surface for air. Large amounts of frass become packed in the gallery behind the feeding larvae. Weakened, diseased, and dead insects become encased in the hardened frass. The feeding tunnel widens as an increasing number of larvae aggregate and advance (Grégoire and Merlin, 1984; reviewed in CAB, 2006).

Countries of Origin

D. micans is believed to have originated in Asia. It has gradually moved westward to many European countries (Haack, 2001).

Current Distribution

This species is present in: Austria, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Japan, Latvia, Lithuania, Luxembourg, Mongolia, Montenegro, the Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Turkey, Ukraine, and the United Kingdom (USDA, 1987, Haack, 2001; CABI, 2009).

Distribution in United States

D. micans is not known to occur in the United States (Haack, 2001). There have been no positive reports of *D. micans* entered into NAPIS (K. Handy, personal communication, 2009).

Pathway

D. micans has most likely travelled to new areas through the international movement of unprocessed logs or lumber as well as by crates, pallets and dunnage made up of host material used for shipping (Haack, 2001).

Pathogens Vectored

D. micans is not a known vector. However, secondary invaders including root disease fungi such as *Heterobasidion annosum* and *Armillaria* spp. have been observed in trees attacked by *D. micans* (Deneubourg et al., 1990; reviewed in Gilbert et al., 2001; reviewed in Haack, 2001

Damage

D. micans causes destruction to the cambium of the host which can debilitate the tree (Great Britain Forestry Commission, 2002). Feeding by larvae can result in girdling and in extreme cases, the tree can be killed. Most infestations occur on the lower bole of a host (Davis et al., 2008). Unlike other bark beetles, a single *D. micans* female can colonize living trees without the need for a mass attack (Great Britain Forestry Commission, 2002).

D. micans larval feeding under bark (Stanislaw Kinelski, Bugwood.org)

Pitch tube on spruce (Stanislaw Kinelski, Bugwood.org)

Dendroctonus micans damage (Beat Forster, Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland, Bugwood.org)

Survey

The CAPS-Approved survey method is visual inspection. There are no known attractants for *D. micans.*

When surveying trees, look for signs of stem or root rot including resin tubes on the trunk or granular resin at the tree base (Great Britain Forest Commission, 2002). Resin tubes may vary in color from white or cream to shades of brown or purple (Great Britain Forest Commission, 2002). Older infestations may have loose bark with galleries present (Great Britain Forest Commission, 2002).

Frass and bark packed into a quilted or island appearance is characteristic of this pest (Great Britain Forest Commission, 2002). Surveys may yield any stage of *D. micans* (Great Britain Forest Commission, 2002).

It may be possible to stratify the landscape into areas where beetle attacks are relatively more likely and where survey efforts should be concentrated. Damaged or forked trees are more likely to be infested than undamaged or straight trees (Fielding et al., 1991). Infestations are also considered likely in stands that meet one or more of the following criteria: ‘close’ to known

infestations (distance not specified); thinned within 5 years, more than 19 years old; close to roads; near new wooden fences that had bark; or within 3 km of a sawmill (Fielding et al., 1991).

When checking unprocessed logs, dunnage, crates, or pallets, which contain bark strips, check the cambium and inner bark for galleries and insect life stages (CABI, 2006).

Time of year to survey
Adult flight can occur during most of the summer. The formation of egg galleries and oviposition is dependent on latitude and altitude and can occur from April-May to August-November (EPPO, n.d.). Adult movement within and between trees is usually by crawling and occurs at temperatures at or above 12°C (53.6°F). Movement by flight occurs at or above 22.5°C (72.5°F) (Great Britain Forestry Commission, 2002).

Identification

CAPS-Approved Method
Morphological. Specimens should be examined under a good quality, high powered (preferably with up to 90X) dissecting microscope, with help of a reference collection.

Mistaken Identities
This pest is similar to other *Dendroctonus* species including *D. punctatus*.

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