

# A) Coleoptera: Curculionidae (weevils)

Family characteristics: One of the largest animal families with ~90,000 described species. While there is considerable diversity in form and size, weevils have distinctive long snouts with chewing mouthparts at the end and clubbed antennae.

## *Steremnius carinatus* Conifer seedling weevil

Economic importance:

Adults feed at the base of vegetation (E). Clear cuts and site preparation encourage the weevil to feed on conifer seedlings. Economic injury has been worst on Vancouver Island and Haida Gwaii.

**Principal hosts: Seedlings of Douglas-fir, Sitka spruce**  
Hemlock and true firs are less preferred but sometimes attacked.

Signs in the field:

1. Pupal cells at the base of seedlings (B, D)

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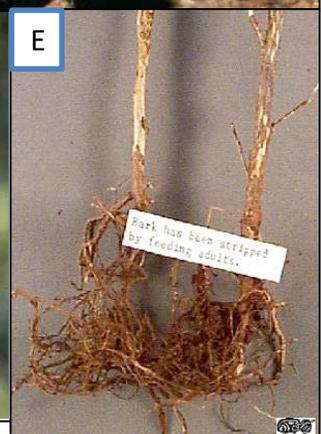
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## Adult

Body	Antennae	Special Feature	Injury
Long and slender snout (C) Red-grey patterns on elytra 7 – 10mm long	Club shaped and obvious	Flightless, adults walk from host to host	<b>Adult is injurious stage</b> Emerge from stumps and girdle seedlings (E)

## Larvae

Body	Injury
Legless, curved (A) White to pink, with brown head capsule Strong mandibles	Larvae live in bark of stumps and slash from recent felling, where they feed on phloem



Images by: A), B) Terry Price, Georgia Forestry Commission, Bugwood.org  
C) USDA Forest Service - Northeastern Area Archive, USDA Forest Service, Bugwood.org  
D), E) [http://www.forestry.ubc.ca/fetch21/FRST308/lab3/steremnius\\_carinatus/collar.html](http://www.forestry.ubc.ca/fetch21/FRST308/lab3/steremnius_carinatus/collar.html)

# *Hylobius warreni*

## Warren root collar weevil

Economic importance:

Feeding by larvae may cause girdling and subsequent tree mortality, as well as serious reductions in growth. May seriously hamper the establishment of pine plantations. Attacks trees from approx. 6 years old to maturity.

**Principal hosts: Lodgepole pine (occasionally other *Pinus* spp., *Abies* spp., *Picea* spp., *Salix* spp.)**

Signs in the field:

1. Chlorotic foliage (young trees) (A)
2. Girdled root collar (B)
3. Mass of resin and frass at root collar (D)

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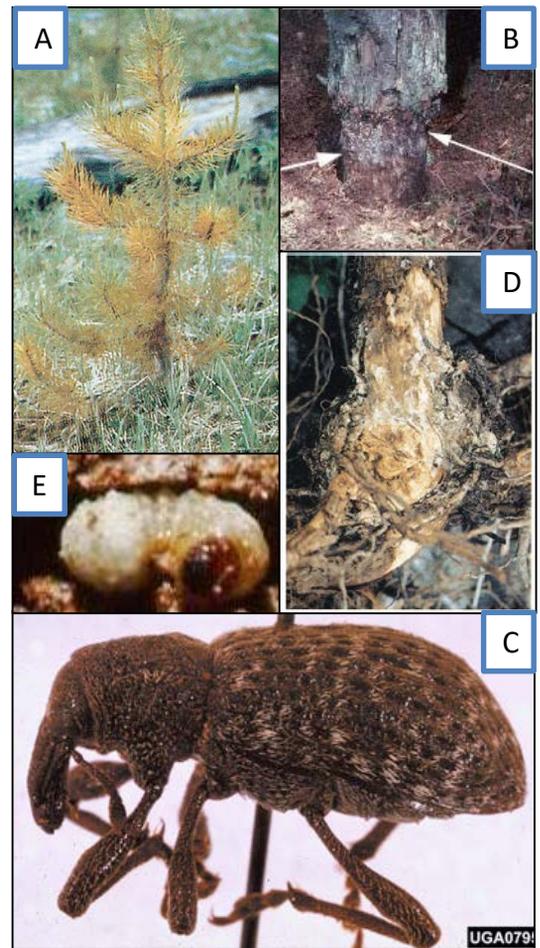
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10mm

### Adult

Body	Special Feature	Injury
Long and slender snout (C) Dull black, with fine grey scales between patches of white 8 – 11mm (C)	Adults flightless	Adults live and lay eggs for up to 4 years, feeding on the bark of small roots, twigs and needles  Can cause chronic infestation throughout the rotation

### Larvae

Body	Injury
Typical curculionid larvae (i.e. curved, legless) (E)	<b>Larvae live for 2 years, feed in root collar area, often causing root collar to be girdled (B)</b>  When feeding around the root collar, dirt and shredded bark are packed together with resin from the tree to make protective “tunnel” (D)

Images: A, D) [www.for.gov.bc.ca/hfp/publications/00198/101%20to%20150/fig115.jpg](http://www.for.gov.bc.ca/hfp/publications/00198/101%20to%20150/fig115.jpg)  
 B) R. Martineau, Natural Resources Canada, Canadian Forest Service  
 C) University of Georgia Archive, University of Georgia, Bugwood.org  
 E) [http://www.forestry.ubc.ca/fetch21/FRST308/lab3/steremnius\\_carinatus/collar.html](http://www.forestry.ubc.ca/fetch21/FRST308/lab3/steremnius_carinatus/collar.html)

# *Cryptorhynchus lapathi*

## Poplar-and-willow borer

Economic importance:

Pest of ornamentals and windbreak trees.

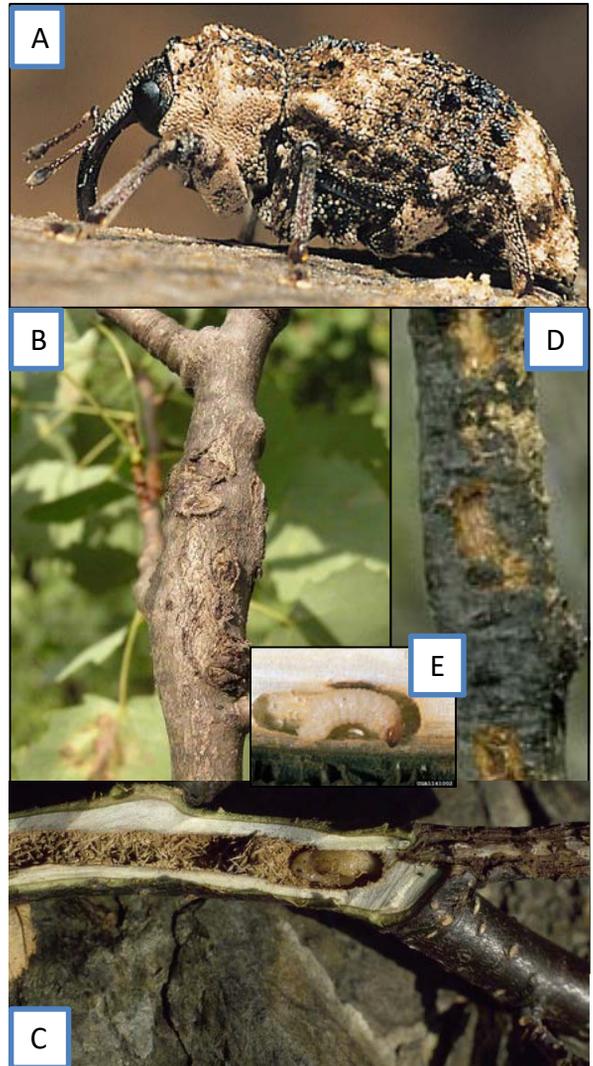
**Principal hosts: *Salix* (preferred), *Populus*, *Alnus*, *Betula spp.* Healthy *Salix* are attacked, but other hosts must be weakened first.**

Signs in the field:

1. Irregular splits and holes in the bark (D)
2. Exudates of sap and moist red-brown boring dust from holes
3. Piles of boring dust around stem base
4. Stems with old attacks are honeycombed with darkened, weathered tunnels, and deformed from the callusing of injured areas (B)

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### Adult

Body	Antennae	Injury
Medium length snout (A) <b>Pitted elytra surface and covered in tufts of hair (A)</b>	<b>Club shaped (A)</b> Small Elbowed	Adults emerge from overwintering in the wood in spring, and soon afterward the female lays eggs in the stem in slits chewed into the bark.

### Larvae

Body	Injury
<b>White body, dark head and mandibles (E)</b> Curved Legless	Larvae first bore into the cambium around the stem, but as they grow they tunnel into the wood (C, E). When fully, grown, they pupate in enlarged galleries in the stem. Complete girdling kills the tree above the injury, forcing the tree to re-sprout multiple stems. Trees weakened by larvae may break.

Images: A, E) Gyorgy Csoka, Hungary Forest Research Institute  
 B) Milan Zubrik, Forest Research Institute - Slovakia, Bugwood.org  
 C, D) Fabio Stergulc, Università di Udine, Bugwood.org

## B) Coleoptera: Buprestidae (Flatheaded borers)

Family characteristics: Larvae flattened in cross-section; thorax broad, with inverted "V" on first thoracic segment with plates above and below (A); legs absent. Require 1-3 years to complete development. In milled lumber, egg to adult development may take decades. Buprestids are the most damaging family of wood borers.

### *Melanophila drummondi* Flatheaded fir borer

Economic importance:

Trees weakened by fire, defoliation or drought may be killed. One of few insect species that will attack and kill western larch.

**Principal hosts: Douglas-fir, *Abies*, *Picea*, *Tsuga*, *Larix* spp.**

Signs in the field:

1. Larvae construct wide, winding galleries that increase in width as larvae grow.
2. Galleries are flattened and packed with frass (C)
3. Larvae **do not** bore into sapwood (C)

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A



B

1mm



C

UGA1207025

### Adult

Body	Antennae	Injury
Typical buprestid elliptical shape (B) Bronzy-black colour <b>3 small yellow spots on each wing cover (B)</b>	Long, black and thin	Adults do not injure trees Lay eggs in bark crevices

### Larvae

Body	Injury
<b>White body flattened (A, C)</b> Sclerotized plates top and bottom (A)	Prefers logs and dead trees, but will kill weakened trees Larvae carves its own tunnel, no central cavity Destroys cambial surface, <b>does not bore into sapwood (C)</b> <b>No fungi/stain</b>

Images: A) Gerald J. Lenhard, Louisiana State Univ, Bugwood.org  
 B) Pennsylvania Dept Conservation and Natural Resources - Forestry Archive, Bugwood.org  
 C) Dave Powell, USDA Forest Service

# *Buprestis aurulenta*

## Golden buprestid

Economic importance:

Most destructive buprestid. Long development time means beetles may emerge from furniture, or buildings several decades after construction.

FYI... Emergence from milled lumber after building construction may damage structures. The Orpheum theatre in Vancouver was water damaged after "bargain priced" roofing timbers, cut from trees salvaged from the Taylor River fire on Vancouver Island, produced a large number of adult beetles which bored straight through the tar roof.

**Principal hosts: Douglas-fir, Ponderosa pine**

Signs in the field:

1. Galleries are flattened and packed with frass (C)
2. Adult exit holes in sapwood are elliptical (D)
3. Sapwood is scored (B)

Notes:

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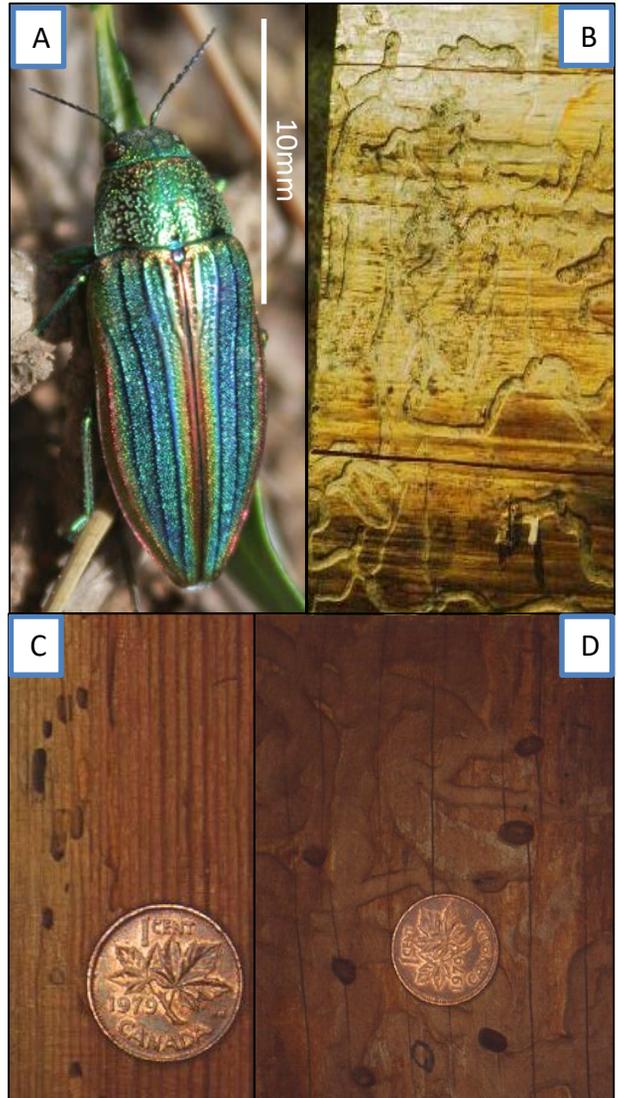
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## Adult

Body	Antennae	Injury
Typical buprestid elliptical shape (A) <b>Brilliant metallic green, with red line along inner and outer elytra (A)</b> Ridges in elytra	Long, black and thin (A)	Adults do not injure trees Lay eggs in bark crevices

## Larvae

Body	Injury
Typical buprestid (white, flattened body), sclerotized plates top and bottom (see <i>M. drummondi</i> )	Larval galleries scores sapwood before commencing boring (B, D) Later instars complete development in sapwood (C)

Images: A) cascades\_nomad [www.flickr.com/photos/dm777/4836906468/](http://www.flickr.com/photos/dm777/4836906468/)  
 B, C, D) [www.forestry.ubc.ca/fetch21/FRST308/lab7/buprestis\\_aurulenta/golden.html](http://www.forestry.ubc.ca/fetch21/FRST308/lab7/buprestis_aurulenta/golden.html)

# *Trachykele blondeli*

## Western cedar borer

### Economic importance:

Severe degrade in lumber where sound wood is required (e.g. poles, shingles). Heavy infestations of the heartwood by the maturing larvae are known as "powderworm" damage.

FYI... Fallers are very concerned when cutting infested trees since the terminal flick that travels to the top of the tree as it starts to fall can snap off the crown causing it to drop directly down on the stump. Damaged wood is sometimes used for ornamental panelling.

### Principal hosts: Western red cedar, occasionally *Juniperus*, *Cupressus*, *Libocedrus*

#### Signs in the field:

1. Felled trees are not attacked.
2. Boring primarily in heartwood of upper bole
3. Heartwood galleries are thick and curvy (C)
4. Galleries packed with frass (B)
5. Adult exit holes are elliptical (D)
6. Damage concentrated in crown area of tree

#### Notes:

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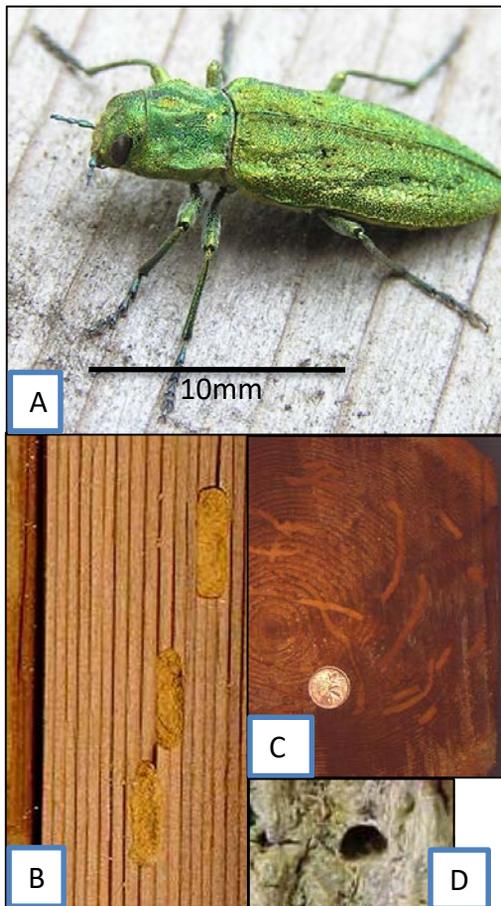
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## Adult

Body	Antennae	Injury
<b>Bright emerald green (A)</b> Golden sheen (A) Several dark spots on elytra	Short, stout, green (A)	<b>Adults feed on foliage</b> Lay eggs in bark of <b>living trees</b>

## Larvae

Body	Special Feature	Injury
Typical buprestid (white, flattened body), sclerotized plates top and bottom	Heartwood borers in living trees	Larvae bore from branches to bole; mine heartwood for 2-3 or more years

Images: A) Derrick Ditchburn URL: <http://www.dereila.ca/whispers/beetles.html>  
 B, C) [www.forestry.ubc.ca/fetch21/FRST308/lab7/buprestis\\_aurulenta/golden.html](http://www.forestry.ubc.ca/fetch21/FRST308/lab7/buprestis_aurulenta/golden.html)  
 D) *USDA Forest Service*, [www.extension.umn.edu/yardandgarden/YGLNews/images2/May1507/eabexit.jpg](http://www.extension.umn.edu/yardandgarden/YGLNews/images2/May1507/eabexit.jpg)

# C) Coleoptera: Cerambycidae

## (Longhorn beetles or roundheaded borers)

Family characteristics: Antennae are very long. Body elongate and cylindrical; pro-thorax with small conical projections from the side.

### *Tetropium velutinum*

#### Western larch borer

Economic importance:

Boring causes lumber degrades and reduced structural quality.

FYI... During the drought of the 1930's this species caused extensive deterioration of larch stands in Washington State.

**Principal hosts: Douglas-fir, western hemlock. (esp. in weakened and dead trees). Occasionally *Abies*, *Pinus* and *Picea***

Signs in the field:

1. Adult exit holes are circular (B)
2. Galleries are elliptical in cross-section (C)
3. Frass packed in galleries beneath bark (D)

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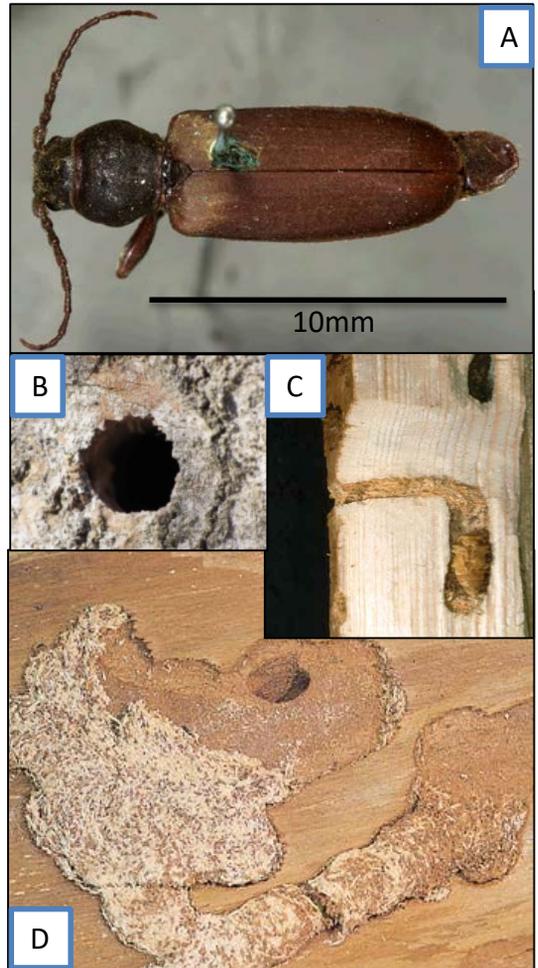
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### Adult

Body	Antennae	Special Feature	Injury
Elongate, cylindrical, velvety brown (A)	Long, thick segmented, pointed (A)	Eyes divided into 2 parts (bisected by antennae)	Adults do not cause injury

### Larvae

Body	Injury
<p><b>White elongated (not strongly tapered)</b></p> <p><b>Elliptical in cross-section</b></p> <p>Distinct segments</p> <p><b>Small thoracic legs present</b></p>	<p>Larvae enter sapwood to pupate (c)</p> <p>Shallow sapwood borer and bark miner (c)</p>

Images: A) [insects.oeb.harvard.edu/mcz/FMPro?-DB=Image.fm&-Lay=web&-Format=images.htm&Species\\_ID=3826&-Find](https://insects.oeb.harvard.edu/mcz/FMPro?-DB=Image.fm&-Lay=web&-Format=images.htm&Species_ID=3826&-Find)  
 B) [media.photobucket.com/image/round%20exit%20hole/phd4me/Feb%202010%20Winter%20Walk/exitholewithmandiblemarks.jpg](https://media.photobucket.com/image/round%20exit%20hole/phd4me/Feb%202010%20Winter%20Walk/exitholewithmandiblemarks.jpg)  
 C, D) Canadian Food Inspection Agency, [www.inspection.gc.ca](http://www.inspection.gc.ca)

# Monochamus spp. Sawyer beetles

## Economic importance:

Beetles may cause extensive damage to dying, recently dead and felled conifers. Adults vector the pinewood nematode.

FYI... *Monochamus* spp. transmit the pinewood nematode (*Bursaphelenchus xylophilus*). The nematode does not normally harm trees in North America, but in Europe and Asia it causes pine wilt disease and is a serious threat to forestry.

## Principal hosts: *Pinus*, *Picea*, *Abies*, Douglas-fir

### Signs in the field:

1. Galleries elliptical, frass filled
2. Adult exit holes are circular (A, D)
3. Larval feeding initially scores sapwood (like some Buprestidae)

### Notes:

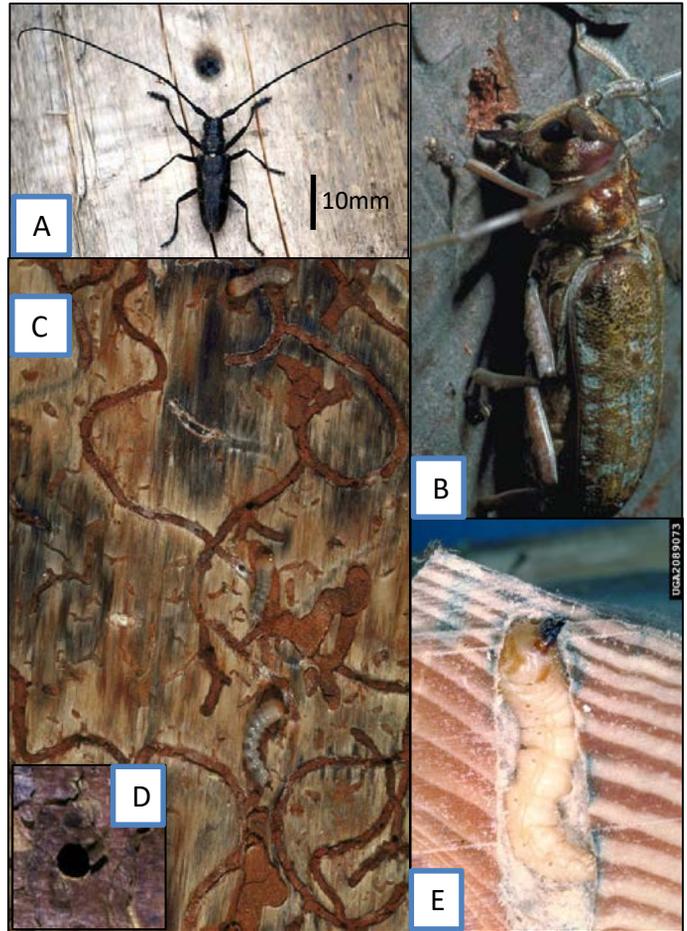
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## Adult

Body	Antennae	Special	Injury
Various colours, usually black-brown (A, B)	<b>Extremely long (A)</b>	Vectors the pine wood nematode	<b>Adults chew niches in bark in which to lay eggs (B)</b>

## Larvae

Body	Injury
Typical cerambycid larva (see Tetropium velutinum)	Larval boring causes extensive injury to dying and felled conifers. Larvae may tunnel more than one year before pupation; <b>first year of attack shows as irregular channelling of wood surface (C)</b>

Images: A) Sharkan, NP Muránska planina, Slovensko, 30.7.2001 URL: <http://www.sharkan.net/58-kozlicek-smrkovy-vrzunik-smrekovy-mono-chamus-sutor>  
 B) R.F. Billings, Texas Forest Service  
 C) W.H. Bennett, USDA Forest Service  
 D) W.N. Dixon, Florida Department of Agriculture and Consumer Services  
 E) L.L. Hyche, Auburn University

# *Ergates spiculatus*

## Timberworm

Economic importance:

Larval mines speed deterioration and limit the amount of timber salvaged from large fires.

FYI... The timberworm is the largest wood borer in BC.

**Principal hosts: Douglas-fir, ponderosa pine**

Signs in the field:

1. Galleries elliptical, packed with frass or shredded wood (C)
2. Adult exit holes are circular (D)
3. Size of damage to wood is the best indicator

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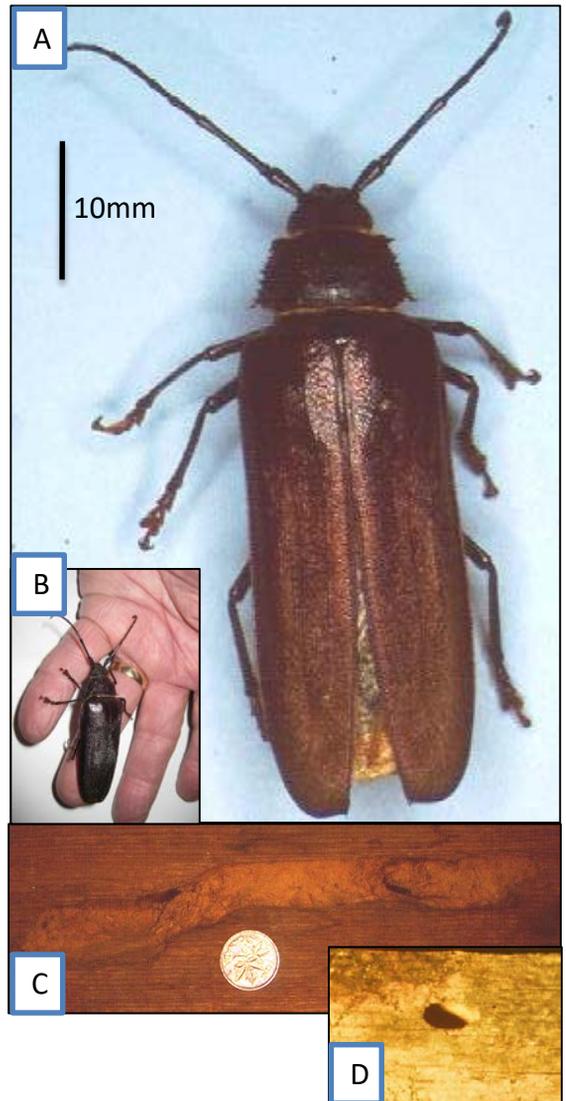
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## Adult

Body	Antennae	Special Feature	Injury
<b>Very large (A, B)</b> Red-brown elytra	Long (typical longhorn beetle)	<b>Sides of thorax are often spiky (A)</b> Beetles from Rocky Mountains have spots on elytra	Adults do not injure trees; eggs laid in bark crevices

## Larvae

Body	Injury
<b>Large grubs (60-70mm)</b> Very small thoracic legs (typical of Cerambycidae)	Larvae create meandering tunnels through sapwood and heartwood (C)  Larvae may tunnel more than one year before pupation

Images: A, C) [www.forestry.ubc.ca/fetch21/FRST308/lab7/ergates\\_spiculatus/timber.html](http://www.forestry.ubc.ca/fetch21/FRST308/lab7/ergates_spiculatus/timber.html)  
 B) P. Burnett  
 D) USDA Forest Service - Ogden Archive, USDA Forest Service, Bugwood.org

# D) Hymenoptera: Siricidae (horntails, woodwasps)

Family characteristics: Stingless wasps; characterized (from other Hymenoptera) by having a broad waist and an ovipositor modified to insert eggs into wood.

## *Sirex cyaneus*

### Blue horntail

Economic importance:

Larval mines degrade lumber, but normally this only becomes a problem following salvage harvest of large burns or windthrow events

FYI... Ovipositing females vector fungi, and also inject phytotoxic mucous to weaken trees.

**Principal hosts:** *Abies*, *Pinus*, *Picea* spp., Douglas-fir

Signs in the field:

1. Larval galleries are circular in cross section (C)
2. Frass packed in galleries (C)
3. Larvae bore directly into wood, no sapwood scoring
4. Galleries typically smaller than most buprestids and cerambycids

Notes:

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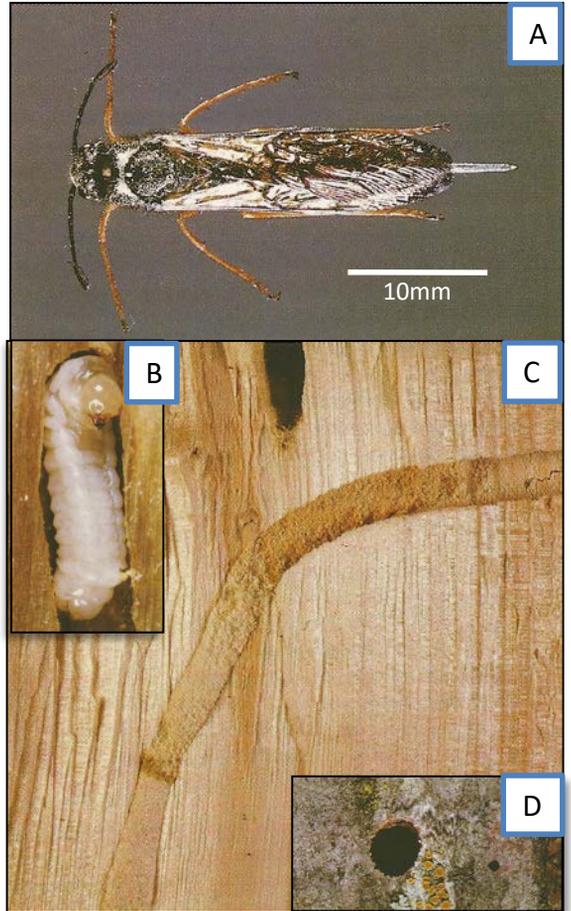
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## Adult

Body	Antennae	Special Feature	Injury
Cylindrical with thick waist and horn-like tail (A)	Longer than head	Two pairs of membranous wings, unequal in size	Females inject toxic mucous during oviposition to weaken trees

## Larvae

Body	Injury
Cylindrical <b>Pointed "tail" (B)</b> <b>Hemispherical capsular head (B)</b> Rudimentary thoracic legs	<b>No sapwood scoring</b> Galleries in sapwood circular in cross section (c,d) Wood may be stained by fungi

Images: A, B, C, D) Natural Resources Canada, Canadian Forest Service