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## Cone and Seed Insect Pest Leaflet No. 7

British Columbia Ministry of Forests and Range,  
Tree Improvement Branch, Saanichton, BC



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### DOUGLAS-FIR SEED CHALCID (*Megastigmus spermotrophus*) SPRUCE SEED CHALCID (*Megastigmus atedius*) and others



*Megastigmus spermotrophus* male on Douglas-fir foliage. Note the large black spot (stigma) on each forewing. These spots are characteristic of seed chalcids and the source of the genus name. (D. Manastyrski)

## INTRODUCTION:

There are at least eight species of seed chalcids found on conifer seed crops in British Columbia. Most species are very host-specific and several are economically important. All have similar life cycles, most of which is spent within seeds. At least two species, *Megastigmus spermotrophus* and *Megastigmus atedius*, are considered to be major pests of conifer seeds.

## TAXONOMY:

Order: Hymenoptera (sawflies, parasitic wasps, ants, wasps, and bees)

Family: Torymidae (torymids)



*Megastigmus spermotrophus* female on Douglas-fir cone (W. Strong)

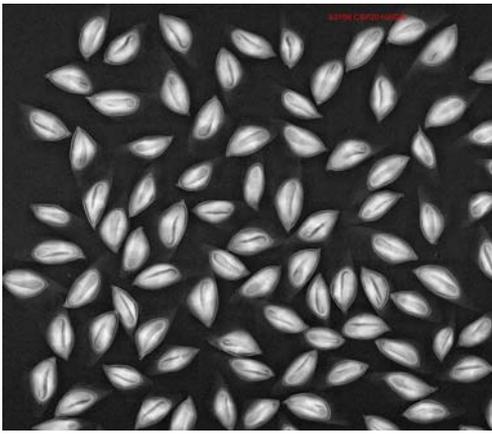
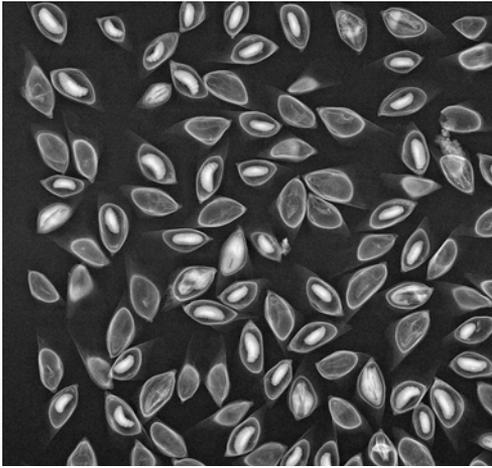
**HOSTS AND DISTRIBUTION:** Most North American seed chalcid species are found throughout the ranges of their hosts. The following species are known to occur in British Columbia:

*Megastigmus spermotrophus* (in Douglas-fir, *Pseudotsuga menziesii*), *M. atedius* (in spruces, *Picea* spp.), *M. albifrons* (in ponderosa pine, *Pinus ponderosae*), *M. tsugae* (in mountain and western hemlock, *Tsuga*

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spp.), *M. pinus*, *M. lasiocarpae*, *M. rafni*, and *M. milleri* (in various true firs, *Abies* spp.).

**DAMAGE:** Each larva develops within and destroys one seed, leaving no external evidence of its presence. Presence of seed chalcid larvae within mature seeds is normally only detectable through x-rays or seed dissections.

 An X-ray image showing a dense collection of healthy, filled seeds. The seeds appear as bright, teardrop-shaped objects against a dark background. A small red text label "D. Kolotelo" is visible in the upper right corner of the image.	<p>X-ray of healthy filled seed (D. Kolotelo)</p>
 An X-ray image showing a dense collection of seeds. Some seeds are partially filled, and several larvae of the seed chalcid are clearly visible within the seeds, appearing as bright, irregular shapes.	<p>X-ray of partially filled seeds, and obvious larvae of <i>Megastigmus</i> (D. Kolotelo)</p>

**IMPORTANCE:** Damage levels are variable depending upon several factors including host species and size of crop. Damage levels have not been accurately quantified but may average from 2-15% of seed crops in most years; crops from individual trees can sustain up to 50% loss. Even so, management of this insect is not practised in BC. Seed loss escapes notice because adult seed chalcids are inconspicuous and cause no visible damage, and infested seeds are almost completely removed from seed crops during standard seed cleaning procedures.

**LIFE HISTORY:** All *Megastigmus* species have one generation per year. Adults emerge over several weeks in spring shortly after pollination is finished. Females use their long ovipositors to bore through cone scales and lay a single egg near the micropylar end of ovules. Individual females of *Megastigmus spermotrophus* may lay up to 150 eggs.

Eggs hatch in a few days and larvae enter seeds where they are nurtured by the host cone. Each infested seed develops a normal seed coat but contains only a seed chalcid larva and no normal seed tissues. Larvae reach maturity in 6-8 weeks and then overwinter within seeds that are retained in cones or fall to the ground. A proportion of the larvae enter extended diapause for two or more years. Pupation takes place in early spring. Adults emerge soon after.

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## Description

**EGG:** No description is available.

**LARVA:** White, C-shaped, legless grub with no distinctive features except tiny dark mandibles at one end.

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Douglas-fir seeds; two showing *Megastigmus* exit holes. (D. Manastyrski)

**PUPA:** No description is available.

**ADULT:** Small wasps, colouration dependent upon species. Males and females have membranous wings with a distinctive dark stigma on the leading edge of each forewing. Adult females have a long ovipositor. Males are smaller than the females of their own species and have no ovipositor. Adult female *M. spermotrophus* are about 4 mm in length; those of *M. atedius*, about 3 mm.



Female *Megastigmus spermotrophus* on Douglas-fir. Arrows indicate prominent dark stigma near margin of each wing. (D. Manastyrski)



Prepared specimen of a female *Megastigmus atedius*. Note ovipositor and characteristic stigma near the margin of each wing. (A. Roques)



Prepared specimen of a male *Megastigmus atedius*. Note characteristic stigma near the margin of each wing. (A. Roques)

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## Detection and Monitoring

A detection program using yellow sticky traps has been developed for use in the northwestern United States, which gives accurate damage predictions. This program has not been tested in BC. To determine levels of infestation in stored seedlots, x-ray random

samples of seed after extraction and cleaning. To determine levels of infestation in cone collections, random samples of seed should be x-rayed after extraction, but prior to removal of the discard fraction.

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## Control

No control protocols have been developed for this insect. Parasitoids can be abundant, but their influence in reducing *Megastigmus* populations is unknown.

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## Key References

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