FGC Forest Genetics Council of British Columbia

Cone and Seed Insect Pest Leaflet No. 5

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

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SPRUCE CONE MAGGOT
(Strobilomyia neanthracina)

Strobilomyia neanthracina adult female on spruce cone (R. Bennett)

TAXONOMY:

Order: Diptera (true flies)

Family: Anthomyiidae (a large family with many common names for species, usually referred to as "anthomyiid "flies)

HOSTS: Most spruce species (*Picea* spp.) in western North America.

DISTRIBUTION: *Strobilomyia neanthracina* is associated with white, Sitka and Engelmann spruces and may be the only species in western spruces. Other species of *Strobilomyia* are associated with red and black spruces in eastern North America.

DAMAGE: Larvae bore through cones around the cone axis, destroying scales and seeds and producing characteristic spiral tunnels filled with resin and small amounts of frass.

Characteristic tunneling holes created by *Strobilomyia neanthracina* larval feeding in spruce cone (W. Strong)

There is usually little external evidence of damage except for inconspicuous larval exit holes. Scales on severely damaged cones

may turn brown prematurely. Damaged cones are usually smaller than healthy ones.

Spruce cones with signs of feeding by *Strobilomyia neanthracina* (R. Bennett)

IMPORTANCE: Spruce cone maggots are a serious pest of spruce cones and seeds in North America. Usually no more than two or three larvae will be found in one cone but this number is sufficient to cause complete destruction of seeds. Spruce cone maggot damage tends to be higher in seed orchards than in natural stands.

In British Columbia, spruce cone maggot is primarily a problem in interior spruce cone crops and is rarely seen at significant levels on the coast.

Description

LIFE HISTORY: One generation per year.

EGG: Pearly white, ovoid with one end flattened, about 1.6 mm x 0.5 mm long.

Strobilomyia neanthracina egg protruding from underneath a conelet scale (D. Manastyrski)

Strobilomyia neanthracina egg on a dissected cone scale (D. Manastyrski)

LARVA: Larvae are whitish, elongate maggots, without a distinct head (head region is marked by a pair of dark mouth hooks), and about 5-7 mm long at maturity (third instar). First instar larvae hatch about 1-2 weeks after oviposition. Second and third instar larvae tunnel around the central cone axis feeding on scale tissue and seeds. Mature larvae tunnel to cone surfaces and drop to the ground in early to mid-July.

Early instar *Strobilomyia neanthracina* larva on spruce cone tissue (W. Strong)

PUPA: Pupation occurs almost immediately after larvae drop to the ground. Pupae overwinter in soil or litter and may enter extended diapause for more than one year. Puparia are reddish-brown, oblong, about 4-6 mm long, and darken with age.

Strobilomyia neanthracina larvae and pupae (darker brown) in a laboratory colony (R. Bennett)

ADULT: Shiny black, about 6 mm long, and resembling a small housefly. Adults are only seen during pollination period in early to mid spring; at that time females can be observed on or near spruce conelets.

Females lay eggs singly between conelet scales. Eggs may be laid near the edges of conelet scales or adjacent to ovules at the bases of scales. During oviposition, females chemically mark cones to discourage other female cone maggot flies from laying eggs on those cones. Usually only one or a few eggs are laid per cone.

Detection and Monitoring

Spruce cone maggot populations should be monitored on an annual basis in seed orchards and controlled when necessary.

Accurate population size estimates and damage predictions can be made by counting cone maggot eggs in random samples of conelets collected immediately after pollination period, when the majority of spruce conelets have closed (usually around mid-May in spruce seed orchards in interior British Columbia). Samples should consist of 1 conelet from the mid-crown of each of a minimum of 50 trees.

Dissect each conelet under a microscope and record the number of eggs observed. A decision to control cone maggot populations will depend in part upon the current value of a crop and the immediate need for seed. An average of 0.3 eggs / conelet indicates a probable seed loss of 15%; this is a suitable spray threshold in most circumstances. Because each larva can cause about the same amount of damage as a spruce seedworm larva (*Cydia strobilella*), the egg counts for the two species are combined and a threshold of 0.3 eggs per cone includes eggs of both species.

To determine whether or not a natural stand spruce cone crop is worth harvesting, randomly collect samples of mature cones prior

to harvest and determine level of tunnelling damage and the number of filled seeds.

Undamaged (above) vs. *Strobilomyia*-damaged (below) spruce cones (W. Strong)

Insect Stages and Monitoring Calendar

Spring pollination period	Post pollination to mid-July	Mid- to late-July	Late summer
Adults emerge from pupal overwintering sites and mate; females oviposit on spruce seed conelet scales.	Larvae tunnel within cones, feeding on scale tissue and seeds.	Larvae drop from cones and burrow into soil beneath trees.	Larvae pupate in ground in late summer; pupae may enter extended diapause for more than 1 year.

Monitoring for *Strobilomyia neanthracina*

Mid- to late-May

Estimate *Strobilomyia* populations by counting cone maggot eggs in random samples collected after pollination period.

If necessary, apply foliar spray of systemic insecticide at completion of pollination.

Control

If predicted seed loss is unacceptable, a foliar spray of systemic insecticides applied when the majority of spruce cones are horizontal should provide good control. This will usually be in late May in spruce seed orchards in interior British Columbia. Currently, dimethoate is the only active ingredient registered in Canada for control of spruce cone maggots.

When cone maggot populations are significant in spruce seed orchards, non-crop cones should be picked and destroyed within three weeks of conclusion of pollination to kill larvae before they emerge from infested cones. This may help to reduce local cone maggot populations in the following year.

Key References

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