FGC Forest Genetics Council of British Columbia

Cone and Seed Insect Pest Leaflet No. 8

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

BRITISH COLUMBIA
The Best Place on Earth

DOUGLAS-FIR CONE MOTH
(Barbara colfaxiana)

Barbara colfaxiana adult (D. Manastyrski)

TAXONOMY:

Order: Lepidoptera (moths and butterflies)

Family: Tortricidae (a very large family with many common names, usually referred to as "tortricids")

HOST: Douglas-fir, *Pseudotsuga menziesii*

DISTRIBUTION: Found throughout the range of Douglas-fir from British Columbia to northern California, Arizona, and northwestern Mexico. It is usually more prevalent in drier, interior locations.

DAMAGE: Cone moth is a serious pest of Douglas-fir seed production. Larvae tunnel through cones in a meandering fashion around the cone axis feeding on scales and seeds. One to several larvae may be present in a single cone. Damage to cones is usually indicated by misshapen appearance, small bore holes, and frass on cone surface; larger cones may exhibit no exterior signs of damage.

Barbara colfaxiana pupa and destroyed seeds in a damaged cone (D. Manastyrski)

IMPORTANCE: Although a serious pest throughout the range of Douglas-fir, coastal populations of Douglas-fir with relatively cool summer climates are usually less at risk to damage than are interior populations in areas with hotter, drier summers. One larva can destroy 60% of the seeds in a cone. Three larvae will likely destroy 100% of the seeds.

Description

LIFE HISTORY: One generation per year.

EGG: Eggs are oval, about 0.7 x 0.8 mm, pearl coloured and laid singly on cone bracts.

LARVA: Yellow-white becoming pinkish with maturity, head capsule initially black, maturing to brown. Young larvae initially feed on cone scales, and then move to seeds as cones mature. Larvae feed for about two months and complete development by mid to late July.

Barbara colfaxiana larva exposed in a dissected Douglas-fir cone (J. Brooks)

PUPA: Pupation occurs within the cone, usually in mid-summer. Pupae are reddish, about 15 mm long, and overwinter in cones within a tough, papery, pitch-coated cocoon. Some pupae may enter extended diapauses for one to several years.

Barbara colfaxiana pupa dissected from its cocoon (D. Manastyrski)

ADULT: Medium-sized (wingspan 15-20 mm), greyish- or reddish-brown with wings banded with grey, silver, and brown. Adults emerge from old cones in early spring during the Douglas-fir pollination period when female conelets are upright, open and pollen receptive. Adults fly in the evening and lay eggs singly on cone bracts.

Detection and Monitoring

In Douglas-fir seed orchards, cone moth populations should be monitored on an annual basis during the spring pollination period. Monitoring protocols are similar to those established for spruce cone maggot and spruce seed moth in spruce seed orchards.

Accurate population size estimates and damage predictions can be made by counting cone moth eggs in random samples of conelets collected immediately after the pollination period, when the majority of Douglas-fir conelets have closed. 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 apply control measures should be based on the current value of the cone crop, the need for seed, and relevant biological facts: one larva can destroy over 50% of seed within a cone; the presence of three or more larvae in a cone will likely result in complete destruction of that cone.

Barbara colfaxiana moth (D. Manastyrski)

The sex pheromone of *Barbara colfaxiana* has been identified and synthesized but has not yet been incorporated into monitoring or control programmes for this insect.

Insect Stages and Monitoring Calendar

Spring pollination period	Post pollination to mid-July	Late July-Winter
Adults emerge from cones and lay eggs singly on Douglas-fir seed cone bracts during the pollination period.	Larvae tunnel through cones, feeding on scales and seeds.	Pupae overwinter in cones. Larvae may enter extended diapause for more than 1 year.

Monitoring for *Barbara colfaxiana*

Estimate *Barbara* populations by counting eggs in random samples collected after pollination period.

A foliar spray of systemic insecticide after completion of pollination should provide adequate control.

Control

If monitoring suggests that expected seed loss will be unacceptable, a foliar spray of systemic insecticides applied when the majority of Douglas-fir cones are horizontal should provide good control. Currently, dimethoate is the only active ingredient registered in Canada. For seed orchards in close proximity to natural stands of Douglas-fir, an overhead application of cold water misting in early spring may hold back budburst sufficiently to put seed orchard trees out of synchrony with natural stand trees. This may reduce potential infestations by the Douglas-fir cone moth.

In seed orchards, destruction of non-crop cones in late summer or early fall may reduce local Douglas-fir cone moth populations. However, this may only be an effective control measure in seed orchards grown in isolation from other Douglas-fir trees.

Key References

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