
Cone and Seed Insect Pest Leaflet No. 2

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



DOUGLAS-FIR CONE GALL MIDGE

(Contarinia oregonensis)



Contarinia oregonensis adult on Douglas-fir foliage

(D. Manastyrski)

TAXONOMY: Order: Diptera (true flies)

Family: Cecidomyiidae (gall midges)

HOST: Douglas-fir, *Pseudotsuga menziesii*

DISTRIBUTION: Occurs throughout the range of Douglas-fir from central British Columbia to north central Mexico.

DAMAGE: Larvae develop within cones in distinctive galls at the bases of cone scales adjacent to seeds. One cone may harbour hundreds of gall midge larvae. Affected cone scales turn reddish brown toward the end of summer.



Douglas-fir cone with distinctive *Contarinia oregonensis* galls (W. Strong)

IMPORTANCE: The Douglas-fir cone gall midge is the most destructive pest of Douglas-fir cone crops in coastal British Columbia and is becoming an important pest of interior BC crops. Seeds may adhere to galled scales (making seed extraction difficult) or fail to develop when midge populations are large. In some years, particularly when cone crops are small, entire crops may be destroyed.

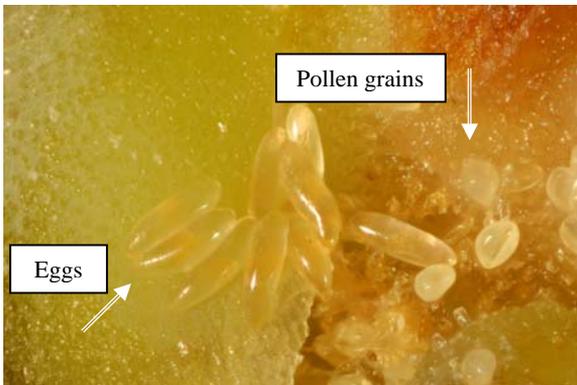
Description

LIFE HISTORY: One generation per year.



Adult *Contarinia oregonensis* on Douglas-fir conelet
(W. Strong)

EGG: Whitish, translucent and cylindrical (about 0.3 mm x 0.1 mm), nestled in clusters between and underneath conelet scales. Eggs resemble elongate Douglas-fir pollen grains and are difficult to see without a microscope.



Contarinia oregonensis eggs and Douglas-fir pollen grains
(D. Manastyrski)

LARVA: First instar larvae are about 0.3 mm long and colourless. Later instars are larger and, when mature (third instar), are orange and about 3 mm long with a distinct “spatula” near the head end. Individual larvae feed within small swollen galls in the bases of cone scales.



Mature *Contarinia oregonensis* larvae in galled scales (D. Manastyrski)

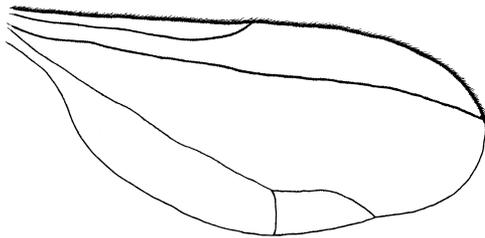
With the onset of cool wet weather in late summer or early fall, mature larvae leave cones and drop to the ground to overwinter in leaf litter (often in old pollen cones).

PUPA: Larvae pupate in February or early March.



Adult male *Contarinia oregonensis* captured in a pheromone-baited trap (W. Strong)

ADULT: Adults emerge in early spring (April-May) during the Douglas-fir pollination period. After mating, female midges lay eggs at the bases of individual conelet scales. Adults are very similar to other midge species: tiny, fragile, mosquito-like flies about 3-4 mm long with clear wings and distinctive “cecidomyiid” wing venation.

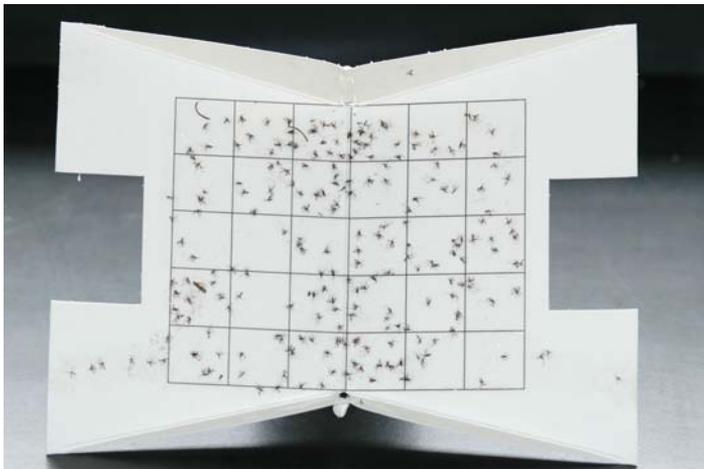


A typical cecidomyiid midge wing. Note that venation is reduced to a couple of strong veins near the leading edge of the wing and a single weaker vein (split near the end) near the back edge.

Detection and Monitoring

Douglas-fir cone gall midge 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 egg-infested scales in random samples of conelets collected during the pollination period. Conelet surveys should be performed immediately after Douglas-fir pollination is finished (but before the conelets have reached the horizontal stage) in April. 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 look for clusters of midge eggs at the bases of scales near the ovules. For each conelet, record the total number of scales infested with midge eggs (don't bother to count the number of eggs!). A decision to control cone gall midge populations will depend in part upon the current value of a crop and the immediate need for seed but, generally, if eggs are recorded on an average of 2.6 or more scales per cone, control may be warranted.

A population-monitoring program using insect traps baited with Douglas-fir cone gall midge sex pheromone is in development but is not yet available for operational usage.



Adult *Contarinia oregonensis* caught in a pheromone trap (W. Strong)

Insect stages and monitoring calendar

Feb	April May	May-August	Sept-Feb
Larvae pupate in leaf litter at base of trees	Adults emerge and begin laying eggs at bases of conelet scales	Larvae feed within distinctive swollen galls at bases of cone scales	Mature larvae drop out of cones and overwinter in litter beneath trees

Monitoring and Control of *Contarinia oregonensis*

Survey conelets for eggs after pollination is complete and before conelets are horizontal

If warranted, apply foliar spray of systemic insecticides to control larvae

Control

When necessary, a foliar spray of a systemic insecticide applied before Douglas-fir cones have reached the pendant stage should provide good control. Currently, dimethoate based products are the only insecticides registered in Canada for control of Douglas-fir cone gall midge.

Hand picking and destroying all non-crop cones has been recommended as a method for reducing cone gall midge populations. However, this is only likely to be an effective control measure in seed orchards grown in isolation from other Douglas-fir trees. A control option utilizing the Douglas-fir cone gall midge sex pheromone may be available in the future.

Key References

- Gries, R., G. Khaskin, G. Gries, R.G. Bennett, G.G.S. King, P. Morewood, K.N. Slessor, and W.D. Morewood. 2002. (Z, Z)-4, 7-Tridecadien-(S)-2-yl acetate: Sex pheromone of Douglas-fir cone gall midge, *Contarinia oregonensis*. *Journal of Chemical Ecology*, 28: 2283-2297.
- Hedlin, A.F. 1974. Cone and seed insects of British Columbia. Canadian Forestry Service, Pacific Forestry Research Centre, Victoria, BC. BC-X-90. 63 pp.
- Morewood, P., W.D. Morewood, R.G. Bennett, and G. Gries. 2002. Potential for pheromone-baited traps to predict seed loss caused by *Contarinia oregonensis* (Diptera: Cecidomyiidae). *The Canadian Entomologist* 134: 689-697.