EPPO Datasheet: *Choristoneura occidentalis occidentalis*

Last updated: 2021-12-07

IDENTITY

Preferred name: *Choristoneura occidentalis occidentalis*
Authority: Freeman
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Lepidoptera: Tortricidae
Other scientific names: *Choristoneura freemani* Razowski, *Choristoneura occidentalis* Freeman
Common names: Western spruce budworm
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EPPO Categorization: A1 list
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EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: ARCHOC

Notes on taxonomy and nomenclature

The taxonomy and nomenclature of *Choristoneura occidentalis occidentalis* Freeman, 1967 has been the subject of some controversy in recent years. Freeman (1967) first described this species based on the examination of specimens from extensive collections of conifer-feeding budworms across North America. Razowski (2008) proposed *C. freemani* as a replacement name after moving the West African species *Cacoecia occidentalis* Walsingham, 1981 to *Choristoneura*. This new name was largely ignored until Gilligan & Brown (2014) discussed the taxonomic issues created by Razowski's (2008) generic reassignment, but provisionally accepted the new name until further evidence was published or a formal challenge was made. Brunet *et al.* (2017) formally challenged Razowski's 2008 transfer of *Cacoecia occidentalis* to *Choristoneura* following a genetic analysis of the *Choristoneura fumiferana* species group in western Canada. Additionally, Brunet *et al.* (2017) demoted the two-year cycle budworm, *C. biennis*, to a subspecies of *C. occidentalis*. More recently, Fagua *et al.* (2019) redefined *Choristoneura* Lederer, 1859 based on a genetic analysis of 105 species of Archipini and other Tortricidae. They exclude C. *freemani* Razowski from *Choristoneura.*

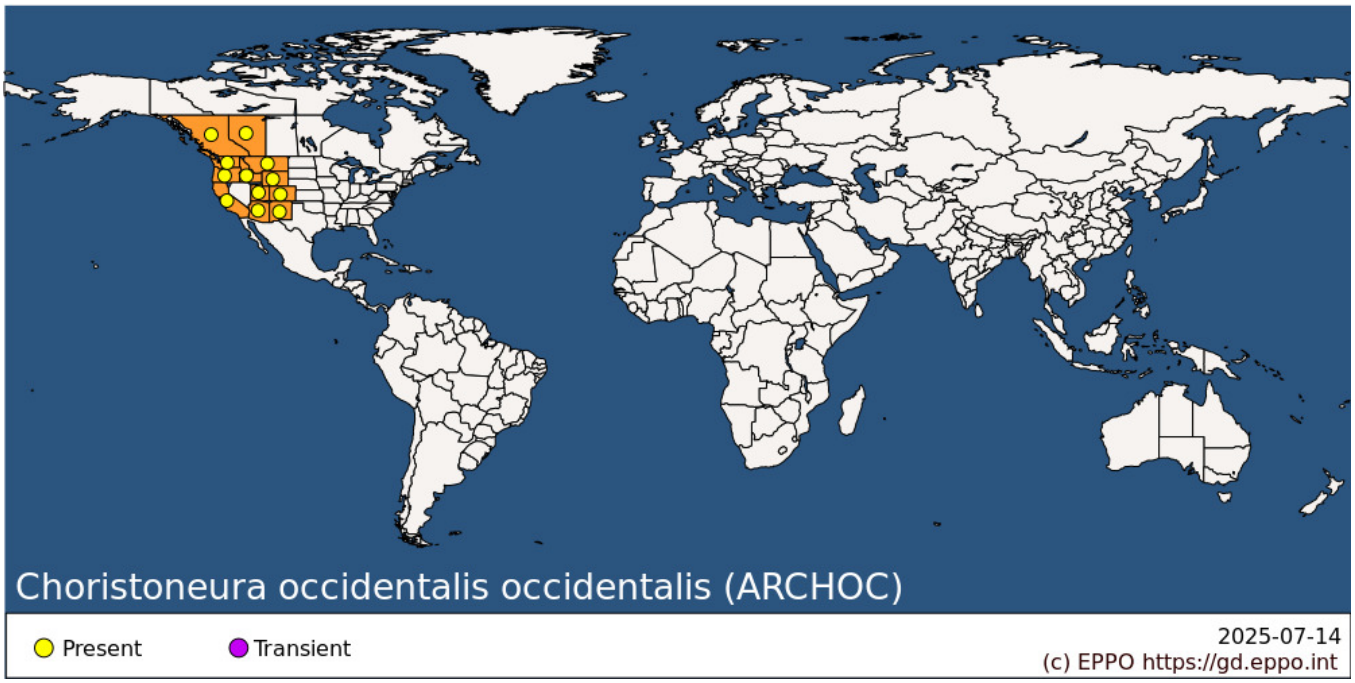
HOSTS

Choristoneura occidentalis occidentalis occurs principally on *Pseudotsuga menziesii* and also on other forest trees such as *Abies concolor*, *A. grandis*, *A. lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *P. glauca* and *P. pungens*. In the EPPO region these host plants can be found in Northern and Central European forests.

Host list: *Abies concolor*, *Abies grandis*, *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Picea glauca*, *Picea pungens*, *Pseudotsuga menziesii*

GEOGRAPHICAL DISTRIBUTION

C. occidentalis occidentalis is confined to North America, where outbreaks were first recorded in 1909 in Vancouver Island (British Columbia, Canada), and in Idaho (USA) in 1922. *C. occidentalis occidentalis* then established itself as a serious pest throughout the Pacific Coast States, British Columbia and Rocky Mountain States. Recent molecular studies of *Choristoneura* in Western Canada have identified populations in southern Alberta and southwest Saskatchewan (Lumley & Sperling, 2011).



North America: Canada (Alberta, British Columbia), United States of America (Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, Wyoming)

BIOLOGY

Eggs are laid in summer (July and August) and hatch in about 10 days. The newly hatched larvae do not feed but spin silken shelters among lichens and under bark scales in which they hibernate. In the following spring, they mine old needles until bud swelling, and then bore into the buds and feed upon the growing needles. Later they loosely web the growing tips and feed upon new needles. Pupation takes place after six larval instars. Predictive models of phenology of this pest for use in integrated pest management have been described (Dennis *et al.*, 1986; Kemp *et al.*, 1986; Nealis & Régnière, 2014).

DETECTION AND IDENTIFICATION

Symptoms

The larvae of *C. occidentalis occidentalis* feed principally in buds and on foliage of forest trees and heavy attacks can cause complete defoliation in 4-5 years. Infested trees can show a growth reduction, deformity, top killing and may die (Alfaro *et al.*, 1982). Damage to cones and seeds has also been observed on *Pseudotsuga menziesii* and *Larix occidentalis* in the Rocky Mountains.

Morphology

Eggs

The eggs are light-green, oval, and about 1.2 long. They are laid in masses (like shingles) on the underside of needles with between 30 and 60 eggs per mass (Carolin, 1987).

Larva

Newly hatched larvae are light-green with brown heads. Head capsules are, on average, 0.27 mm wide in first instar larvae and increase to an average of 1.86 mm wide in sixth instars (Stein, 1981). Fully-grown larvae are 25-32 mm long with a brownish head, olive and reddish-brown body and prominent ivory spots at the setal bases (Carolin, 1987).

Pupa

12-16 mm long, broad at the head end but tapering rapidly toward the tail. Colouration is typically reddish brown.

Adult

Generally, the adults are mottled orange-brown or rust coloured, occasionally grey, approximately 11 mm long with a wing-span of 22-28 mm (Freeman, 1967).

Detection and inspection methods

Eggs are predominantly laid on the underside of needles and due to their cryptic coloration are difficult to see. Acciavatti & Jennings (1976) found that examining branches under UV light increased the probability of egg detection.

Second-instar larvae overwintering in silken hibernacula can only be reliably detected by washing foliated branches for several hours in a 2% solution of heated sodium hydroxide, followed by sieving and separating the small larvae using hexane floatation (Allen *et al.*, 1984).

Actively feeding *C. occidentalis* ssp. larvae can be distinguished from other associated larvae using the key of Stevens *et al.* (1984).

PATHWAYS FOR MOVEMENT

Passive wind dispersal can occur as larvae spin down on long silken threads (Fellin, 1984), and spread is also ensured by moth flight. In international trade, *C. occidentalis occidentalis* is liable to be carried by plants for planting and cut foliage of conifer host plants as second-instar hibernating larvae. Egg masses are only laid on live foliage and, as they typically hatch within 10 days, present minimal risk (Carolin, 1987).

PEST SIGNIFICANCE

Economic impact

C. occidentalis occidentalis is one of the most destructive forest defoliators in Western North America. Heavy and repeated attacks can lead to top-killing of the trees and tree mortality (Alfaro *et al.*, 1982, 1985).

Control

Population control and foliage protection can be achieved through the use of aerial applications of *Bacillus thuringiensis* subsp. *kurstaki* (Cunningham, 1984). Applications of baculoviruses against *C. occidentalis occidentalis* do not appear to be sufficiently effective (Otvos *et al.*, 1989). Natural enemies such as the parasitoids *Glypta fumiferanae*, *Apanteles fumiferanae* and *Phytodietus fumiferanae* can affect populations of *C. occidentalis occidentalis* (Furniss & Carolin, 1977), but do not seem to prevent outbreaks and subsequent defoliation in most parts of its range (Nealis, 2016). Silvicultural methods, such as thinning (Carlson *et al.*, 1984) and nitrogen fertilization, may have an influence on pest populations, though they do not appear to be predominant environmental factors (Mason *et al.*, 1992).

Phytosanitary risk

This serious pest of forest trees presents a definite risk for Northern and Central European forests.

PHYTOSANITARY MEASURES

Prohibition of the import of plants and cut foliage of *Abies*, *Larix*, *Picea* and *Pseudotsuga* from infested countries can be recommended as appropriate measures to prevent introduction of *C. occidentalis occidentalis*.

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Datasheet history

This datasheet was first published in 1997 in the second edition of 'Quarantine Pests for Europe', and revised in 2021. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

CABI/EPPO (1997) *Quarantine Pests for Europe (2nd edition)*. CABI, Wallingford (GB).

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