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FOREST Pest LEAFLET

Pacific Forestry Centre

Western Blackheaded Budworm

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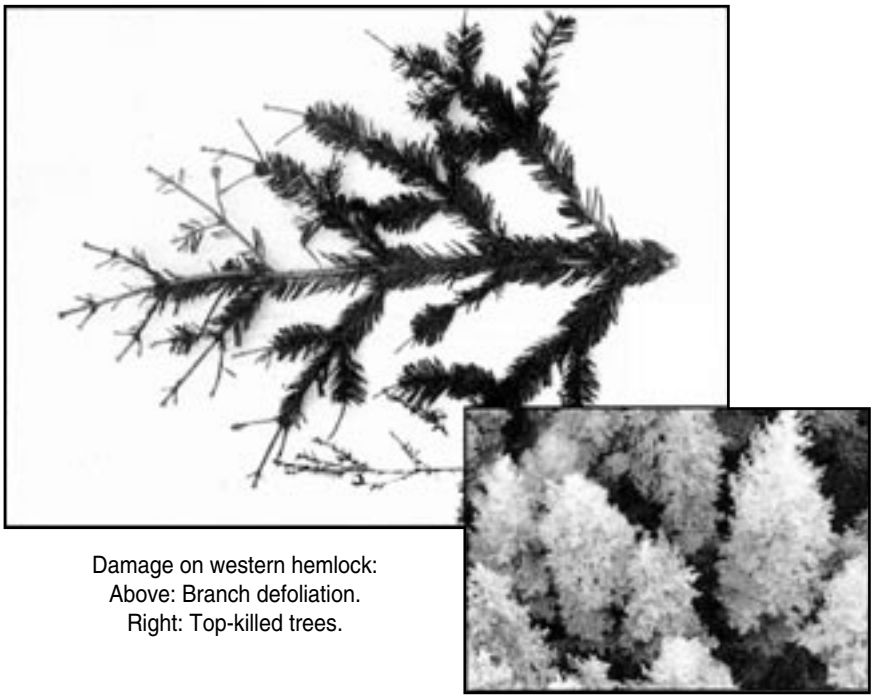
Introduction

The western blackheaded budworm, *Acleris gloverana* (Walsingham) (*Lepidoptera: Tortricidae*), is a defoliating insect occurring throughout British Columbia that periodically causes extensive defoliation of coniferous forests. Severe damage occurred on the coast in the 1940s and 1950s, notably on northern Vancouver Island and the Queen Charlotte Islands; there was some tree mortality. In the interior, there were smaller infestations at several localities in the 1950s but little tree mortality was recorded. From 1965 to 1968, there was light to moderate defoliation over much of the hemlock forests of the Kamloops and Nelson forest regions, and along the Hope-Princeton Highway east of Hope. In 1969, scattered heavy defoliation occurred in hemlock stands from Howe Sound to Harrison Lake north of the Fraser River. Many hemlock forests were severely defoliated on Vancouver Island from Jordan River to Holberg in 1970. Although defoliation occurred on over 166 000 ha in 1972, the infestation subsided in 1973 without significant tree mortality. The Queen Charlotte Islands and the adjacent mainland coast were lightly defoliated by the western blackheaded budworm in 1972; by 1974 defoliation extended over 127 000 ha, but tree mortality was restricted to several small patches of forest. Populations continued at mainly endemic levels until 1984 when 19 000 ha of old-growth forest were defoliated in Revelstoke and Glacier national parks. After extensive feeding in 1985, defoliation peaked at 56 000 ha on the Queen Charlotte Islands and near Kitimat in 1986. By 1987, successive years of defoliation by budworms in conjunction with hemlock sawfly, *Neodiprion tsugae* Middleton, resulted in 25% mortality of second-growth hemlock over 3100 ha on the Queen Charlotte



Damage on western hemlock:
Above: Branch defoliation.
Right: Top-killed trees.

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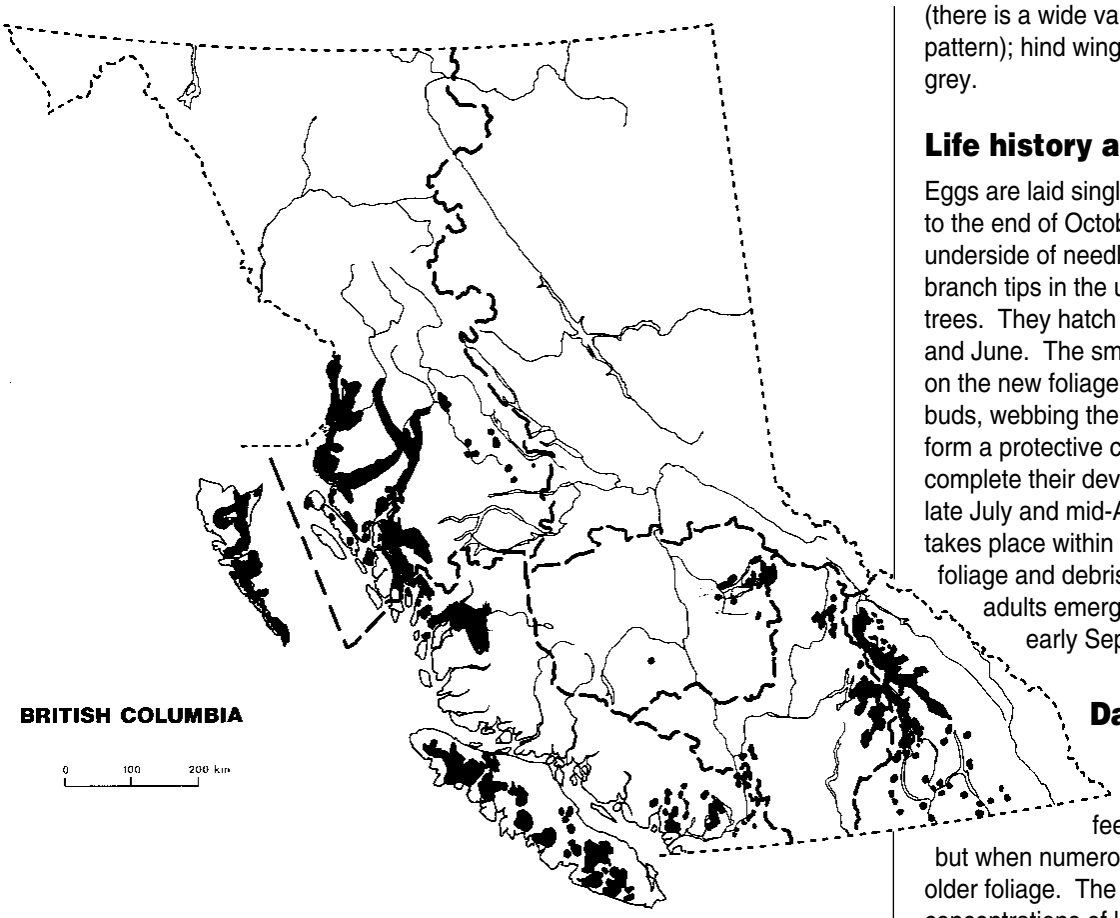

Areas of most common occurrence, 1926-1991.

Islands. Since then, small infestations have occurred on northern Vancouver Island, most notably over 7400 ha near Holberg in 1988. Some top-kill and mostly light defoliation of subalpine fir occurred in the eastern part of the Prince Rupert Forest Region from 1982 to 1988. By 1990, populations subsided to mostly non-damaging levels across the province.

Hosts and distribution

The western blackheaded budworm occurs across western North America. In British Columbia, it is most abundant west of the Cascade Mountains and in interior wet belt areas. The preferred hosts are western hemlock and the true firs; spruce and Douglas-fir are also attacked. It is a close relative of *A. variana* (Fernald) which is often found in association with the eastern spruce budworm [*Choristoneura fumiferana* (Clemens)] on spruce and balsam fir.

Description

Egg: Pale yellow on underside of needle. Oval, flattened, about 1 mm in diameter, one to several on a needle.

Larva: A bright green to yellowish green body with a black or brown head and thoracic shield (behind head), about 18 mm long at maturity.

Pupa: About 12 mm long; first turning green, to brown; end of abdomen is square cut with two incurved spines.

Adult: A small, patterned grey to brown moth. Wing expanse 15-18 mm; forewings yellowish buff or pale grey marked with dark grey, brown, orange or black (there is a wide variation in color and pattern); hind wings grey or brownish grey.

Life history and habits

Eggs are laid singly from late August to the end of October on the underside of needles, usually near branch tips in the upper crown of host trees. They hatch the following May and June. The small, pale larvae feed on the new foliage of the opening buds, webbing the needles together to form a protective covering. The larvae complete their development between late July and mid-August. Pupation takes place within webs spun in the foliage and debris on the twigs. The adults emerge in late August and early September.

Damage

The larvae at first confine their feeding to new growth, but when numerous they will feed on older foliage. The heaviest concentrations of larvae are usually in the upper crowns of trees. Severe defoliation for one or two years may result in top-kill. If an outbreak continues for more than two or three years, the risk of tree mortality becomes high. Some infestations have lasted up to four or five years.

At times, this budworm may occur simultaneously with caterpillars of the hemlock sawfly. Under conditions of severe attack by both insects, trees may be completely defoliated in a single year.

Preliminary information collected from coastal permanent sample plots (Wood and Garbutt 1990), including data from trees completely defoliated

Overwintering eggs on underside of western hemlock needle.

Larva on western hemlock foliage.

Pupa

Moths: Left: Two wing pattern variation. Above: Adult moth at rest.

for up to four consecutive years, suggests major loss of radial (trunk) growth increment. Such damage can reduce harvestable wood volume by up to 20%. Many trees recover and attain normal foliage complements within a few years. However, other trees that recover have dead tops or crooked stems which ultimately may result in reduced log length and value.

Detection

When defoliation has been severe, a stand may take on a reddish brown appearance toward the end of July due to the dying of partially eaten foliage which remains attached to larval webbing. Discoloration is usually heaviest in the upper crown. Look for black-headed, green-yellow bodied larvae feeding on new foliage; careful observation may reveal webbing on twigs. Adults may be seen in flight from late August to October, and eggs are present in the fall and winter. Old infestations may be identified by scattered dead-topped trees or, in the case of severe repeated attack, by groups of dead standing trees.

Management

Natural control of populations

Insect parasites, various predators including insects and birds, diseases, and abnormal weather conditions (cold, wet summer periods) all contribute to the natural decline of outbreaks of this budworm. Starvation, caused by too many larvae and insufficient food, often is the most significant factor terminating an outbreak.

Recent data (Wood and Van Sickle 1991) has confirmed the importance of egg and larval parasitism. A small braconid wasp, for example, was found in up to 85% of budworm larvae during collections in the Prince Rupert Region in 1989. Another parasitic wasp, *Ascogaster* sp., averaged 43% parasitism of larvae. Small forest song birds are known to be effective natural enemies and a disease caused by the fungus *Entomophaga* (*Entomophthora*) *aulicae* is known to kill larvae.

Abundant preferred food supply and a paucity of the natural control factors, alone or in combination, are suspected major reasons for the periodic population surges or outbreaks of the blackheaded budworm.

Spray treatments

Only experimental aerial spray applications or operational trials have been made from 1956 to 1990 (Otvos 1991; Prebble 1975; DeBoo and Taylor, in press) for control of damage by this occasional pest. Most recently, trials using commercial formulations of the bacterial insecticide *Bacillus thuringiensis kurstaki* (Btk) suggest the possibility of strategic applications of this material, particularly within parts of sensitive coastal watersheds. Please contact specialists at the Pacific Forestry Centre or at offices of the British Columbia Forest Service for details about Btk or other spray treatments.

Silvicultural prescriptions

Presently, comprehensive silvicultural recommendations to mitigate attack and damage by this insect are unavailable. Silviculturalists and resource management specialists should be aware of local budworm occurrences and impacts, however. Growth and survival data from permanent sample plots will be most valuable to (1) determine stand composition and density requirements, and (2) estimate probability, frequency and severity of future outbreaks in a particular area. In certain areas where the probability of periodic outbreaks is high and where the preharvest stand composition is mostly the preferred host species, reforestation prescriptions might include higher percentages of non-host species and irregular distribution of stand age classes.

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Additional Information

Additional copies of this and other leaflets in this Forest Pest Leaflets series, as well as additional scientific details and information about identification services, are available by writing to:

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