



Western Hemlock Looper

H.P. Koot

Pacific Forestry Centre

Introduction

The western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst) (Lepidoptera: Geometridae), is one of the most destructive defoliators of conifers in British Columbia. Populations can increase suddenly and outbreaks may persist for several years. Outbreaks of the western hemlock looper can result in severe defoliation and extensive mortality.

The first recorded damage in the province occurred in Stanley Park, Vancouver, in 1911. In 1928-1930 severe defoliation occurred in the Indian River Valley. There were significant timber losses on Vancouver Island in the Klanawa, Sarita, Caycuse and Nitinat valleys between 1945 and 1947 and also in the Interior in the Big Bend, Lardeau, and Wells Gray Park areas. Severe defoliation occurred in the McBride area in 1955. The looper again reached epidemic levels in Stanley Park in 1959, and caused severe defoliation at Hidden Lake in the Interior. From 1969 to 1972 many hemlock, cedar and amabilis fir were killed at Coquitlam Lake and in 1972 and 1973 defoliation extended from Nakusp to Boat Encampment on the Columbia River. Loopers killed trees



Western hemlock looper larva

over 1200 ha in Wells Gray Park in 1976. Between 1982 and 1984 defoliation occurred in many mature hemlock-cedar stands from Upper Arrow Lake to Mica, Seymour River, near Shuswap Lake, Quesnel Lake and along Canoe Reach on McNaughton Lake. The most recent infestations originated in the Revelstoke area and along the Columbia River in 1990. From 1991 to 1993 defoliation continued in this area and also extended along the North Thompson Valley, including Adams River and Wells Gray Park, along the Fraser River between

Prince George and McBride, and along McNaughton, Horsefly and Quesnel lakes. Scattered tree mortality was common in most areas.

Although most outbreaks have occurred in mature and overmature hemlock and hemlock-cedar stands, some infestations were in vigorous 80- to 100-year-old stands. Tree mortality in mature and immature stands ranged from 20-100% when trees were 80% defoliated and subjected to subsequent secondary insect attack.



Natural Resources
Canada

Ressources naturelles
Canada

Canadian Forest
Service

Service canadien
des forêts

Canada



Western hemlock looper eggs



Severe defoliation of western hemlock by western hemlock looper

Hosts and distribution

The preferred host is western hemlock. However, during outbreaks many other species of conifers are also defoliated, including western red cedar, true firs, Douglas-fir, spruces, western white pine, and western larch. Various deciduous species, and understory shrubs may also be defoliated.

The western hemlock looper is found throughout western North America. In British Columbia it occurs principally south of 56°N latitude, but with heaviest concentrations in coastal and interior wet belt forests. Outbreaks generally occur in the Coastal Western Hemlock and Interior Cedar Hemlock biogeoclimatic zones. Some infestations have extended into the Interior Douglas-fir Zone along the Columbia River and in the Sub-boreal Spruce Zone near Prince George. Recently outbreaks have occurred more frequently in the interior of the province than on the coast.

Description

Egg: The egg is smooth, somewhat barrel-shaped, and translucent grey to brown. It is approximately 1 mm long x 0.75 mm wide.

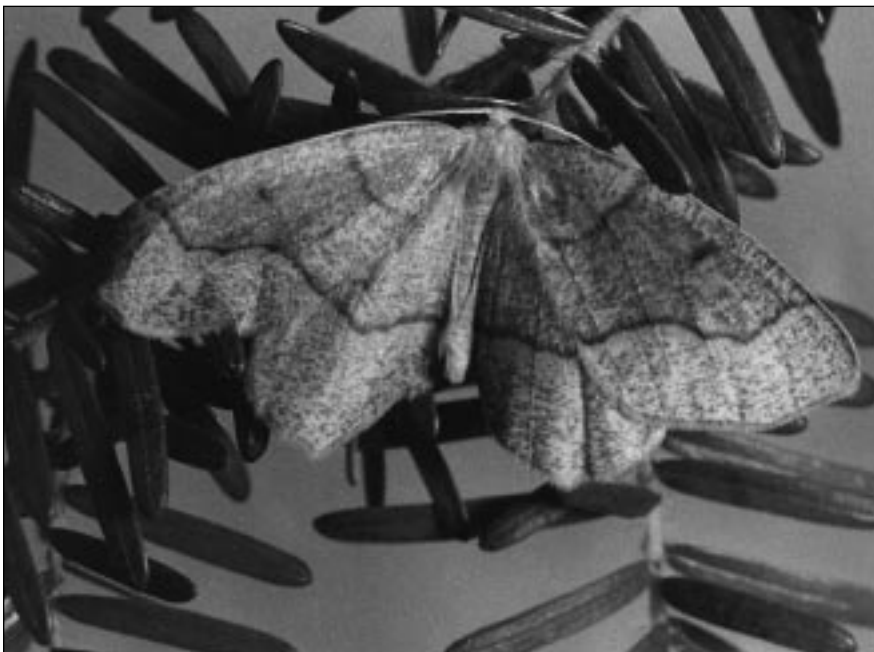
Larva: The larva is a looper 5-35 mm long and passes through six instars or life stages. Between the first and third instars the young larva is banded with light grey and has a black head. The mature larva is variegated grey to dark brown with a complex linear pattern and diagonal pattern; there are four prominent dark spots on the dorsum of each abdominal segment as well as the head capsule.

Pupa: The pupa is a mottled greenish brown, 11-15 mm long.

Adult: The moth is fawn colored with a wing expanse of about 32 mm. The forewings are marked with two darker wavy lines and the hind wings with one.



Western hemlock looper pupa



Western hemlock looper adult

Life history and habits

Eggs are laid in September and early October, singly or in groups of 2 to 10, on substrates such as moss and lichen, in bark crevices of tree trunks and branches and on foliage. During infestation peaks, oviposition may occur on litter on the forest floor. There are six larval instars. First and second instars are light feeders on buds, whereas later instars are wasteful feeders on foliage. Young larvae emerge from overwintered eggs from late May to mid-June. Warmth and light draw them to the tops of crowns

where early feeding occurs. There they often go undetected until they are more mature and descend to feed lower in the crown. Prior to pupation from August to early September, the larvae drop on silken threads to the forest floor and lower branches. Pupation occurs in bark crevices, moss, lichen, or in debris on the forest floor and lasts between 10 and 14 days before adult emergence. Adults generally fly and mate from late August to early October. There is one generation per year.

Damage

Initial feeding by immature larvae is light. By mid-July larvae begin to feed voraciously on both old and new foliage. The larvae are wasteful feeders. Needles are often chewed off at the base and drop; other needles that are partially chewed off usually dry out, turn brown, and then drop. In severe infestations, trees may be stripped in a single season. Defoliation begins in the upper crown, but as feeding progresses more of the crown is affected, increasing the risk of top-kill and tree mortality.

Detection

Outbreaks tend to occur in valley bottom stands containing a high proportion of mature and overmature western hemlock. They are frequently limited in area, but several may develop at widely scattered locations at the same time, or become widespread and cover several thousand hectares.

In a severely infested forest, trees turn yellowish red, then brown, as though scorched by fire. Larvae descend from branches on silken threads when disturbed. The ground may be littered with pieces of needles chewed at their bases. The weak-flying moths may be noticed in September and October in the forest or found as dead adults collected in large numbers in pools and creeks.

Eggs can subsequently be detected on moss and lichens on the trunk and branches of trees.

Control

Natural Control factors

Outbreaks usually last about three years, after which they are mainly controlled by the action of parasites, predators, and disease. In British Columbia, the looper is host to some 47 parasites, which in the egg and larval stages have played an important role in controlling populations.

Two diseases, a nuclear polyhedrosis virus and a fungus pathogen, *Entomophthora* sp., have also been significant control agents. Heavy rains during the flight period can reduce egg laying and adverse weather during hatching may also substantially reduce populations. Larval starvation is a factor in terminating infestations where severe defoliation has occurred.

In eastern Canada, a bacterium, *Bacillus thuringiensis* var. *kurstaki* (B.t.k.), has been sprayed on outbreaks of eastern hemlock looper to control outbreaks.

In British Columbia two formulations of B.t.k. (Foray® and Dipel®) were tested west of Revelstoke in 1993 and were shown to effectively control the western hemlock looper.

Selected references

- Furniss, R.L.; Carolin, V.M. 1980. Western forest insects. U.S. Dept. Agric. Misc. Publ. No. 1339. pp. 205-208.
- Harris, John W.E.; Dawson, A.F. and R.G. Brown. 1982. The western hemlock looper in British Columbia 1911-1980. Can. For. Serv., Pac. For. Cent. Inf. Rep. BC-X-234, 18 p.
- Koot, P.; Hodge, J. 1992. History of population fluctuations and infestations of important forest insects in the Kamloops Forest Region. Can. For. Serv., Pac. For. Res. Cent. FIDS Rep. 92-11, 112 p.
- Turnquist, R. 1991. Western hemlock looper in British Columbia. For. Can., Pac. For. Cent. FIDS Rep. 91-8, 24 p.
- Unger, L. 1992. History of population fluctuations and infestations of important forest insects in the Nelson Forest Region 1923-1991. FIDS Rep 91-8, 104 p.

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:

Natural Resources Canada
Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C. V8Z 1M5
<http://www.pfc.forestry.ca>
Phone (250) 363-0600

Revised November 1994
PDF Version August 2000



Natural Resources
Canada

Canadian Forest
Service

Ressources naturelles
Canada

Service canadien
des forêts