History of Population Fluctuations and Infestations of Important Forest Insects in the Vancouver Forest Region

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HISTORY OF POPULATION FLUCTUATIONS AND INFESTATIONS OF IMPORTANT FOREST INSECTS IN THE VANCOUVER FOREST REGION

By

R.O. WOOD[1/]

Pacific Forest Research Centre

Canadian Forestry Service

Environment Canada

Victoria, British Columbia

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1/ Forest Insect and Disease Survey Ranger, Victoria, B.C.

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VANCOUVER MAINLAND SECTION

INTRODUCTION

This report constitutes a history of some important forest insects in the Vancouver Forest Region since 1911. The report is divided into two sections, Mainland and Vancouver Island.

It serves to:

1. Designate the species of insects which have caused damage in the past and are presumably capable of causing damage in the future.

2. Record the pattern of population fluctuations.

3. Designate areas that appear to have chronic insect problems.

4. Point out the possibility of damage in different areas by insects, including species not known to have caused damage in the Vancouver Forest Region in the past.

Widespread sampling of insect populations began in 1946, with the expansion of the Forest Insect and Disease Survey. Before 1946, surveillance was mainly confined to industrialized areas; therefore, reports of infestations in remote areas were sporadic. Observations have gradually improved due to expanded road systems and through the use of aircraft for surveillance of forest problems.

Logging started before 1900 in low elevation areas in the Lower Fraser Valley. Most mature timber was logged and the land converted to agricultural or industrial purposes, except land reserved for parks, watershed use and a few private timber holdings. However, other low elevation stands in tributary valleys, logged in the early 1900's, were left for forestry use and reseeded naturally. These included the Capilano, Indian, Pitt, Chehalis, Harrison and Chilliwack River valleys. Most mature timber in these areas is confined to high elevations and is rapidly being logged. To a lesser extent, the same applies to forests on the Sechelt Peninsula and mainland inlets. During periods of high looper populations in mature stands, much lower populations were found in surrounding low elevation immature stands than in mature stands at high elevations. However, as the second-growth timber in valleys logged shortly after 1900 reaches semi-maturity, and the habitat changes, these stands may become more susceptible to insect attack.

In summary, major forest insect outbreaks were as follows: since 1900, western hemlock looper outbreaks have occurred in mature timber from 1911 to 1913 in Stanley Park; 1928 to 1930 in Stanley Park and Indian River Valley, in 1945-46 in Seymour and Indian River valleys, and at Coquitlam Lake in 1969-71. Small infestations of phantom hemlock looper occurred in Queens and Central parks in 1956-57 and in Hope Park in 1957. Large populations of green-striped forest loopers were found in

Stanley Park and in unlogged areas of the Capilano Valley in 1957-58 and in the Mamquan Valley in 1967-68. Saddleback loopers have been commonly found in Stanley Park and in North Vancouver mountains and valleys but have not caused serious damage.

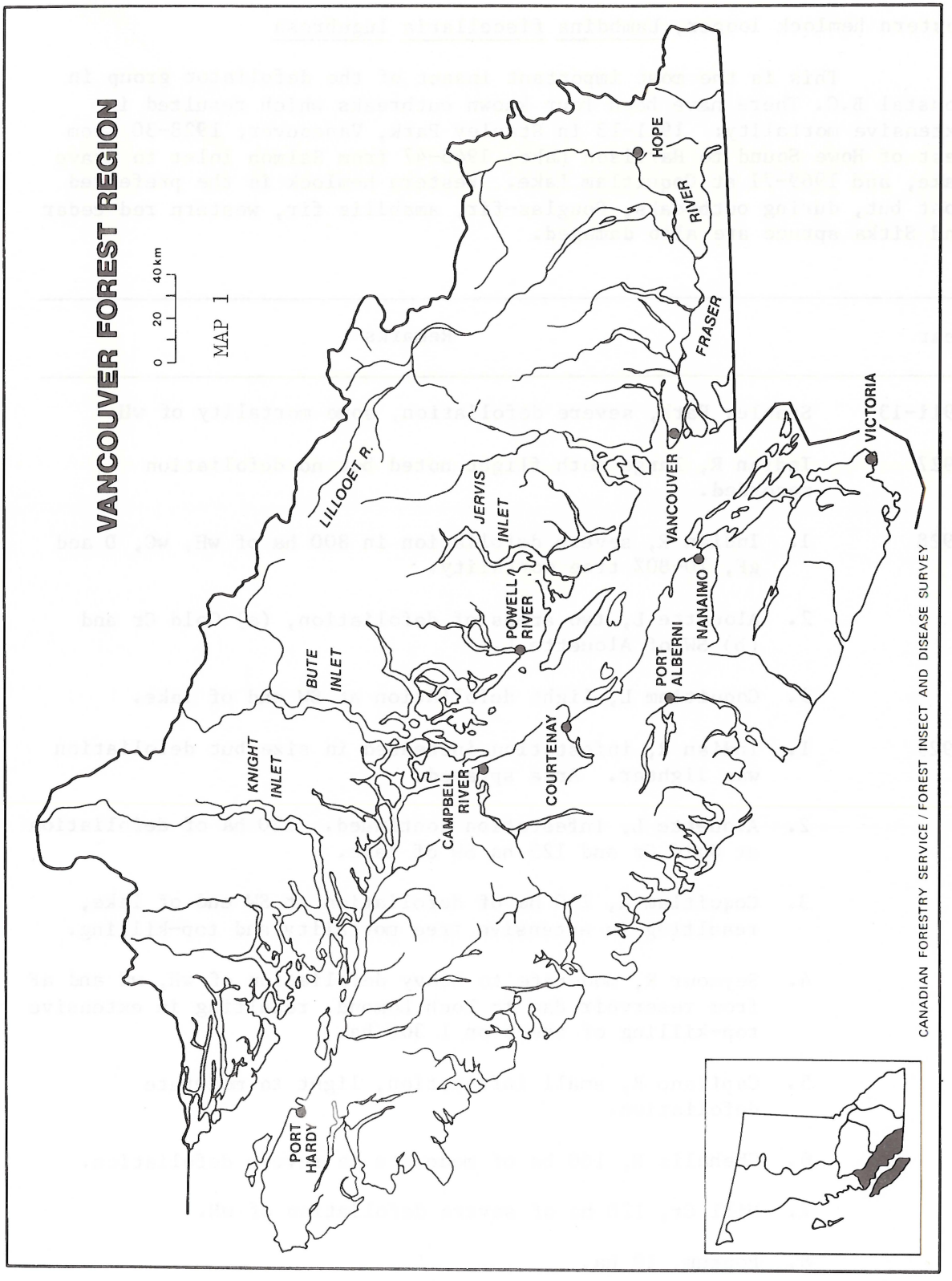
Major outbreaks of blackheaded budworm occurred in hemlock-amabilis fir stands in 1926-30, 1940-41 and 1966-69. There was heavy defoliation but only minor tree mortality. Two large infestations of spruce budworm, 1943-44 and 1953-58, on Douglas-fir in the Lillooet and Fraser River valleys resulted in little tree mortality. However, tree mortality is resulting from a third infestation which began in 1969 and is currently active.

The balsam woolly aphid has caused annual mortality of amabilis fir since its presence was noted in the late 1950's. To date, spruce mortality caused by spruce aphid has been confined to non-forest sites.

Mountain pine beetles killed extensive but undetermined numbers of mature western white pine in the 1940's and 1950's. More detailed records of western white pine and lodgepole pine mortality were made in the 1970's. Periodically the Douglas-fir beetle has killed moderate numbers of trees in the drier portions of the District.

Information in this report was compiled from Annual District Reports, Forest Insect and Disease Survey, British Columbia 1936-1981, unpublished reports 1929-1981, and a variety of published histories of insects in British Columbia.

Host tree abbreviations are shown in Appendix I.


VANCOUVER FOREST REGION
0 20 40 km
MAP 1
HOPE
FRASER RIVER
LILLOOET R.
JERVIS INLET
VANCOUVER
VICTORIA
BUTE INLET
POWELL RIVER
NANAIMO
PORT ALBERNI
KNIGHT INLET
CAMPBELL RIVER
COURTENAY
PORT HARDY
CANADIAN FORESTRY SERVICE / FOREST INSECT AND DISEASE SURVEY

DEFOLIATORS

Western hemlock looper, Lambdina fiscellaria lugubrosa

This is the most important insect of the defoliator group in coastal B.C. There have been four known outbreaks which resulted in extensive mortality: 1911-13 in Stanley Park, Vancouver; 1928-30 from west of Howe Sound to Harrison Lake; 1945-47 from Salmon Inlet to Stave Lake, and 1969-71 at Coquitlam Lake. Western hemlock is the preferred host but, during outbreaks, Douglas-fir, amabilis fir, western red cedar and Sitka spruce are also damaged.

Year	Remarks
1911-13	Stanley Park, severe defoliation, some mortality of wH.
1927	Indian R, large moth flight noted but no defoliation recorded.
1928	1. Indian R, severe defoliation in 800 ha of wH, wC, D and gF, 70-80% tree mortality.
	2. Alouette L, two areas of defoliation, (a) Gold Cr and (b) SW of Alouette L.
	3. Coquitlam L, light defoliation at SW end of lake.
1929	1. Indian R, infestation increased in size but defoliation was lighter. Area sprayed.
	2. Alouette L, infestation continued. 320 ha of defoliation at Gold Cr and 125 ha SW of lake.
	3. Coquitlam L, 260 ha of defoliation at SW end of lake, resulting in extensive tree mortality and top-killing.
	4. Seymour R, moderate to heavy defoliation of wH, wC and aF from reservoir dam to Loch Lomond, resulting in extensive top-killing of trees on 1 300 ha.
	5. Capilano R, small infestation, light to moderate defoliation.
	6. Chehalis R, 160 ha of moderate to severe defoliation.
	7. Mill Cr, 120 ha of severe defoliation of wH.
	8. Popkum, 10 ha.
	9. Stanley Park, high population.

Year	Remarks
1930	Stanley Park, moderate defoliation, Park sprayed.
1931-42	Larvae scarce.
1943	Low populations.
1944	Increased populations.
1945	N side of Fraser R and adjacent to Howe Sound, extensive damage.
1946	1. Seymour, Burwell, Eastcap and Palisade creeks, severe defoliation. 2. Widgeon Cr, extensive tree mortality. 3. Indian R Valley, high population but only light defoliation.
1947	Infestations subsided, high parasitism recorded, collections of 158 larvae at Burwell Cr, 22 at Seymour Cr, 69 at Lost L and 13 at Widgeon Cr.
1948	Low populations. One or two larvae per collection in Seymour Cr Valley.
1949-52	Low populations.
1953	Generally low populations. Avg of 9 larvae at Jones L. One wH collection at Vancouver Bay contained 36 larvae.
1954	Generally low populations. Avg of 4 at Vancouver Bay.
1955	Low populations.
1956	Common in small numbers, one collection at Roger Cr contained 40 larvae.
1957	Generally low populations.
1958	61 larvae in one collection at Prospect Point. Stanley Park sprayed, but mainly because of high green-striped forest looper population.

Year	Remarks
1959	Stanley Park, moderate population. Collections in Seymour Cr Valley contained up to 24 larvae and 19 at Coquitlam L.
1960	Generally low populations, one collection in Stanley Park contained 18 larvae.
1961	Low populations. Largest collections contained 13 larvae in Stanley Park and at Coquitlam L.
1962-67	Low populations.
1968	Increased populations. Highest at Harrison L, Lost Cr, Salsbury L.
1969	Increased populations from Jervis Inlet to Harrison L. Collections in mature hemlock-cedar stands surrounding Coquitlam L contained up to 300 larvae but caused only light defoliation. Up to 50 larvae per collection were taken at scattered sites in Salmon, Narrows and Jervis inlets.
1970	Severe defoliation of wH and aF on 80 ha on E side of Coquitlam L with up to 900 larvae per collection. A fungus disease, Beauvaria sp., was present on dead pupae and adults in October.
1971	Outbreak at Coquitlam L increased to 250 ha with severe defoliation and some tree mortality on 60 ha.
1972	Populations at Coquitlam L decreased; average of 28 larvae per collection. About 10% of the larval population were believed to be Nepytia phantasmaria. Larval parasitism of both species occurred; some pupae infected with a fungus, Entomophthora sp.
1973	Some defoliation on the island in Coquitlam L where 700 larvae were found in one collection. Area of tree mortality has now been clear-cut in salvage logging. Avg no. of larvae per positive sample for whole Region was 4.7.
1974	Coquitlam L population collapsed. Low poulations elsewhere.
1975	Very low populations.
1976-81	Low populations.

Phantom hemlock looper, Nepytia phantasmaria

An important defoliator of conifers, mainly Douglas-fir, the hemlocks, western red cedar, Sitka spruce and the true firs. Infestations have occurred east of Howe Sound, but only occasional larvae have been collected in the northwest part of the Mainland Section. Losses have been small in the past, partly due to chemical control. However, this insect, along with the western hemlock looper, probably poses a significant threat to coniferous stands in the future.

Year	Remarks
1928-29	Indian R, present in large numbers in the western hemlock looper infestation.
1930-31	Indian R, populations declined. Stanley Park, severe defoliation; Park sprayed in 1931, a few wH killed.
1932-39	Scarce.
1940-47	Not mentioned in reports.
1948	Populations low; found at Yale.
1949	Scarce.
1950	Low, found only in Capilano, Seymour, Coquitlam and Alouette valleys.
1951	Low populations.
1952	Low populations.
1953	Low populations.
1954	Largest collection was 15 at Tenas L.
1955	Largest collection was 11 at Boston Bar.
1956	Small infestations on wH and D in Central and Queens parks.
1957	Infestations in Central and Queens parks continued plus small outbreak in Hope Park. Central and Queens sprayed with DDT, damage prevented in Central Park but approx. 740 m^3 killed in Queens Park (60% wH, 40% D).
1958	Infestations collapsed.

Year	Remarks
1959	Scarce.
1960	Low populations. Up to five larvae per collection in Hope Park.
1961-64	Low populations.
1965	Increase, collections of up to 62 in Central Park, 21 at D'Arcy and 12 in Hope Park.
1966	Low populations.
1967	Low, largest collections, 8 in Hope Park, 6 at Stave Falls.
1968	Low populations.
1969	Larvae commonly found in association with western hemlock looper. Up to 55 taken on D at Coquitlam L.
1970	Only three larvae found in entire Region.
1971	Populations generally low. Numerous pupae collected in hemlock looper infestation at Coquitlam L; 33% were killed by fungus diseases Isaria sp. Beauvaria sp.
1972	Greatest increase in population occurred at Clearbrook where defoliation by Douglas-fir tussock moth occurred.
1973	Low populations.
1974	Low populations.
1975	Low populations.
1976-81	Not mentioned in reports.

Green-striped forest looper, Melanolophia imitata

A damaging defoliator in coastal hemlock-cedar stands. Douglas-fir, the true firs, spruces and pines are also attacked. Mortality has occurred in Queen Charlotte and Vancouver Island infestations but none has been recorded in the Mainland Section. Severe defoliation occurred in Stanley Park in 1958 which might have resulted in tree mortality if the park had not been sprayed with chemicals. Before 1949, this insect occurred only sporadically and was not considered to be a significant pest.

Year	Remarks
1949-55	Common but little damage.
1956	Low populations, increase.
1957	Moderate populations.
1958	High populations in Stanley Park, Capilano R Valley and Stave Falls. Up to 450 larvae per sample in Stanley Park, light to moderate defoliation of overstory wH and D, severe on understory trees. Park sprayed with DDT.
1959	Decrease but common, 111 larvae on wH at Grouse Mtn, Stanley Park population controlled.
1960-65	Low populations.
1966	Higher populations. Largest collection contained 112 larvae at Ruskin.
1967	High populations in Sechelt Pen.-Redonda I. E of Howe Sound, confined to Mamquan R Valley.
1968	Decreasing populations, a fungus disease, Entomophthora sp., was prevalent in larvae in all areas.
1969	General decrease. Small numbers found in mountains north of Vancouver.
1970-74	Low populations.
1975	Notable increase in populations in northern areas.
1976-81	Low populations.

Saddleback looper, Ectropis crepuscularia

A common defoliator of most conifers in B.C. wet belt areas. Not known to have caused serious damage in the Mainland Section. A severe infestation near Kitimat in the early 1960's resulted in extensive mortality.

Year	Remarks
1949	Low population.
1950	Increase but low population.
1951	Common.
1952-64	Scarce.
1965	Low, avg 2.2 larvae in southern areas.
1966	Increase, low population. Largest collections contained 16 larvae at Narrows Inlet and on Grouse and Seymour mtns.
1967	Low, avg 2.5 larvae. Common on wH at Salsbury L, and on wC in Stanley Park and Seymour Cr Valley.
1968	Low, avg 1.0 larvae. Increase north of Vancouver, 11 on Grouse Mtn and 6 in Capilano R Valley.
1969	Low, avg 1.0 larvae.
1970	Avg of 20 larvae per positive sample.
1971-81	Very low populations.

Green velvet looper, Epirrita autumnata

A common, but so far insignificant defoliator of the hemlocks, true firs, spruce, Douglas-fir and western red cedar.

Year	Remarks
1948	Low populations.
1949	Common, slight increase.
1950	Slight increase, an avg of 3.0 larvae E of Howe Sound, the largest collection contained 12 larvae.
1951-57	Not mentioned in reports.
1958	E of Howe Sound, avg 8.4 larvae (avg 19 in Seymour Valley). W of Howe Sound, avg 4.4.
1959-61	Not mentioned in reports.
1962-64	Low populations.
1965-66	Not mentioned in reports.
1967	Scarce.
1968	Fraser Valley north, common in small numbers, largest collection 10 on mH at Cypress Cr.
1969	Roberts Cr and Woodfibre, common, up to 34 larvae per collection.
1970-81	Larvae common in low numbers.

Western winter moth, Erannis vancouverensis

A defoliator of a wide rangeof deciduous trees. The maples are the preferred hosts in the Mainland section. Outbreaks have been scattered and of short duration. No mortality has been recorded.

Year	Remarks
1957	Skookumchuck, larvae numerous
1958	Skookumchuck, increase, avg 48 larvae, the largest collection 127, vM severely defoliated, 45% larvae parasitized. Stanley Park, up to 34 larvae per collection.
1959	Skookumchuck, infestation collapsed, presumably from parasitism.
1960-61	Not mentioned in reports.
1962-64	Low populations.
1965-66	Not mentioned in reports.
1967-69	Up to 7 larvae per collection on vM and dM in the vicinity of Spuzzum and North Bend.
1970-71	Not mentioned in reports.
1972	Localized moderate population at Railroad Cr; light defoliation of a few understory Al trees.
1973	Populations low in Mainland areas.
1974-81	Not mentioned in reports.

Western blackheaded budworm, Acleris gloverana

There have been three periods in the last 40 years when budworm caused noticeable defoliation over a relatively large area: Howe Sound and Burrard Inlet, 1926-30; Mission and Vancouver, 1940-41; Hope Slide area, Fraser Canyon tributary valleys and Ruby Creek, 1966-68, and Howe Sound, Indian, Coquitlam and Pitt R valleys in 1969. In each infestation parasites, virus diseases or adverse weather conditions reduced the populations after two or three years and very little tree mortality occurred. Western hemlock and amabilis fir are the preferred hosts in the Mainland Section, although larvae are commonly found on Douglas-fir, grand fir, Sitka spruce and mountain hemlock.

Year	Remarks
1926-28	Howe Sound, moderate defoliation.
1929-30	Burrard Inlet, moderate defoliation.
1931-35	Scarce, no outbreaks reported.
1936-39	Common but no outbreaks reported.
1940	McConnel Cr (Steelhead), 75% of current wH foliage and 10% of current aF foliage lost on several km^2.
1941	1. McConnel Cr, decrease, moderate defoliation of wH and aF.
	2. Vancouver to Surrey, moderate defoliation.
1942	McConnel Cr and Vancouver, infestations subsided.
1943	Not mentioned in reports.
1944	Harrison L, light defoliation of wH.
1945	Moderate populations, no damage reported.
1946	Scarce.
1947	Widespread distribution but few in numbers.
1948	Scarce.
1949-51	Low populations.
1952	Increase E of Howe Sound.

Year	Remarks
1953	Generally low populations, largest collections at Jones L.
1954	Increase, six wH collections on Liumchen Cr averaged 34 larvae.
1955	Several collections near Yale averaged 25 larvae. The largest collection was 48 at Seymour Inlet.
1956	Decrease in larvae collected, but moderately high egg counts (9.8 eggs per 18" tip) in northern areas.
1957	Up to 200 larvae per collection on Hardwicke and Harbledown Is, but low egg counts. Several collections in Capilano and Seymour Cr valleys averaged 48 larvae.
1958	Populations collapsed.
1959-60	Low populations.
1961	Low, largest collection contained 14 larvae in Queens Park.
1962-63	Low populations.
1964	Generally low, largest collection contained 37 at Mt. Coulter (Hope Slide area).
1965	Increase, one collection in Queens Park contained 139 larvae.
1966	Hope Slide area, small infestation, over 300 larvae per wH collection.
1967	1. Hope Slide, severe defoliation (up to 90%) of immature wH and aF in 200 ha of valley bottom. Light to moderate defoliation in 2 000 surrounding ha. 2. Coquihalla Valley, 200 ha of severe plus 800 ha light to moderate defoliation of wH and aF. 3. Ruby, Inkawthia, Stoyoma and Scuzzy creeks, light defoliation. 4. Rising populations in Mamquam R area.

Year	Remarks
1968	1. Hope Slide, less defoliation, 40 ha severe at Wray Cr plus 1 200 ha from trace to 15%. Avg 95.4 larvae per collection, but feeding appeared limited by cold, wet weather. 2. Coquihalla R., Ruby Cr and Fraser Canyon areas, decreased defoliation. 3. Salsbury L, North Shore Mtns, Furry Cr and Mamquam R, increasing populations, light to moderate defoliation of current foliage of wH and aF.
1969	1. Hope Slide, Coquihalla R., Ruby Cr and Fraser Canyon areas, infestations collapsed. 2. Moderate to high populations occurred from the west side of Howe Sound to Harrison L. Defoliation in hectares was: (a) Mills Cr, 120 moderate, 200 light; (b) Indian R, 560 severe, 720 moderate, 600 light; (c) Pitt R, 280 severe, 800 moderate, 640 light; (d) Coquitlam L, 120 severe, 520 moderate, 360 light; (e) Stave R, Chehalis R, Sloquet Cr drainages, 880 light.
1970	Up to 50% of current year's foliage lost at Stawamus R, Furry and Henrietta creeks and Capilano R. More severe defoliation in Indian R valley.
1971	Decreased populations. Two areas of defoliation - 50 ha at Furry Cr and 40 ha at Britannia Cr.
1972	Indications of a population increase between Howe Sound and Gilford Island.
1973	Light defoliation of understory trees at Furry and Woodfibre creeks.
1974-81	Low populations.

Western spruce budworm, Choristoneura occidentalis

There have been three major outbreaks in the past 40 years. In 1943-44, infestations occurred in the vicinity of Pemberton and at the headwaters of the Skagit R. From 1953 to 1958, severe infestations occurred in the Lillooet R Valley and in the Fraser Canyon. During the current outbreak, which began in 1969, infestations have recurred in the Pemberton Valley, Fraser Canyon and Skagit River Valley. Tree mortality and top-kill has become evident in some areas, notably at Railroad Creek northwest of Pemberton.

Year	Remarks
1933-37	No outbreaks reported, larvae scarce.
1938	No infestations but larvae common on D at Lulu I.
1939-42	Not mentioned in reports.
1943	Severe defoliation of D from Pemberton to Anderson L, also 80 km^2 of severe defoliation at the headwaters of Skagit R (Skaist Cr).
1944	Pemberton and Skagit R, extensive infestations.
1945	Infestations presumably collapsed.
1946-52	Low populations.
1953	Increase in Fraser Canyon, Anderson R and Nahatlatch R. Lower populations in Lillooet R Valley.
1954	Lillooet R Valley, from Mt. Currie to Port Douglas, 230 km^2 of defoliation (15-75% up to 900 m el). 60 km^2 of defoliation in Fraser Canyon - Nahatlatch R area.
1955	Pemberton, Owl Cr, Birkenhead and D'Arcy areas, infestation increased to 360 km^2. Fraser Canyon area increased to 75 km^2 of defoliation.
1956	Lillooet R Valley, Tisdall - D'Arcy 1200 km^2 of defoliation. Anderson R, 80 km^2.
1957	Lillooet R Valley, 1300 km^2 of defoliation (200 km^2 severe, 90 km^2 moderate, 1000 km^2 light). Anderson R infestation subsiding.

Year	Remarks
1958	Lillooet R Valley, additional 390 km^2 of light defoliation.
1959	Populations collapsed, largest collection contained six larvae.
1960	Populations low, largest collections contained 14 and 11 larvae near Hells Gate.
1961	Low populations, largest collection contained 21 in Queens Park.
1962	Low populations.
1963	Moderate increase, largest collection contained 19 larvae at North Bend. Light defoliation on D at Ainslie Cr (Boston Bar).
1964	Low populations.
1965	Low, 17 larvae in one collection in Queens Park.
1966	Low, collections of 16 in Queens Park, 12 at D'Arcy and 11 at Hope.
1967	Low, avg 3.0 larvae in Fraser Canyon and 2.5 near D'Arcy.
1968	Fraser Valley and Canyon, 63% of collections were positive vs 39% in 1967 and averaged 6.1 larvae. Pemberton area, 71% of collections positive vs 33% in 1967 and averaged 3.6 larvae. Largest collections: Abbotsford, 27; Hope, 25 and Clearbrook, 16.
1969	Increase in Pemberton - D'Arcy area, 100% of collections contained an average of 8.0 larvae. Light defoliation of immature D at Pemberton Meadows and lower Blackwater Cr. Collections of 42, 21, 17 and 13 larvae were taken at Hope, Alice L, Hells Gate and Boston Bar, respectively.
1970	Infestations increased from Pemberton to Salal Cr, along Soo R and Rutherford Cr and in Haylmore Cr Valley. Light to severe defoliation on 5 000 ha.
1971	Infestations continued in Pemberton Valley; new outbreaks occurred in the Blackwater Cr - Birkenhead L area, along Fraser R between Hope and Boston Bar and southeast of Hope at Tashme. Defoliation was light to severe over 11 000 ha.

Year	Remarks
1972	Infestations continued in all previously infested areas and a new outbreak occurred at Cheakamus L northeast of Squamish. Total area of defoliation was 22 000 ha.
1973	Infestations continued with new areas of defoliation along the Coquihalla R, Eight Mile Cr east of Hope, near western edge of Manning Park, along Nahatlatch L and R and along Green R at north end of Lillooet L. Total area defoliated was 54 000 ha.
1974	Infestations persisted in all previously infested areas with new outbreaks along Lillooet L and Silverhope Cr - Skagit R. Total defoliated area was 77 000 ha.
1975	Infestations declined along Lillooet R northwest of Pemberton and expanded along Lillooet L, Fraser Canyon, Silverhope Cr - Skagit R and Nahatlatch L. Light to severe defoliation occurred over 80,000 ha. At Railroad Cr, 8% of trees in a study plot have been killed by repeated defoliation.
1976	Areas of defoliation decreased in Lillooet R Valley but intensified in Fraser Canyon and Skagit R areas; defoliation occurred on 71 400 ha. Populations partially controlled by Entomophthora fungus.
1977	Defoliated areas increased to 90 200 ha in the same areas.
1978	Light to moderate defoliation recorded along Skagit R Valley, Coquihalla R and from north of Yale to Nahatlatch R; total area of defoliation was 25 200 ha. Light defoliation was recorded during ground surveys at Owl and Haylmore creeks and Birkenhead L.
1979	Total area of defoliation was 19 800 ha; severe along Coquihalla and Skagit rivers and at Siwash Cr, lighter in patches from Yale to Keefers. No defoliation in Pemberton area.
1980	Defoliation was severe along the Lower and Upper Skagit R, Coquihalla R, Siwash Cr, East Anderson R; lighter defoliation occurred in patches in these areas and along east side of Fraser R from north of Hope to Mowhokam Cr, along Nahatlatch R and L and at Spuzzum Cr. Moderate defoliation recorded at Glacier L and Smith Cr. Total area of defoliation was 27 300 ha.

Year	Remarks
1981	Infestations subsided, larval feeding affected by wet, cool weather. 40 ha of light defoliation recorded at Haylmore Cr and 350 ha of moderate to severe at Urquhart Cr.

Silver-spotted tiger moth, Halisidota argentata

A common, native defoliator of conifers in southwestern B.C. Large populations usually occur near tide water, but small numbers have been found as far inland as Chilliwack. Douglas-fir is the preferred host, but western hemlock, lodgepole pine, grand and amabilis firs, western red cedar and Sitka spruce are also occasionally defoliated. Overwintering takes place in the larval stage so that noticeable defoliation occurs in the spring before most other insects are active. No tree mortality has been recorded.

Year	Remarks
1934	Chilliwack, small infestation on D. First record in the Mainland Section.
1935	Quadra I, small infestation on D at Heriot Bay.
1936-40	Scarce.
1941	Vancouver, occasional webs noted.
1942-46	Not mentioned in reports, presumably scarce.
1947	Lower Mainland, moderate numbers.
1948	Low population. Found in Stanley Park and at Horseshoe Bay.
1949-54	Scarce.
1955	Gibsons Landing to Lund and Johnstone Strait islands, large populations along coastal fringe area.
1956-59	Scarce.
1960	Vancouver to Powell R, common, caused little damage.
1961	Vancouver to Powell R, increase.
1962	Vancouver to Powell R, increase, moderate to severe defoliation in Stanley Park, West Vancouver, Gibsons Landing and Sechelt.
1963	Vancouver to Powell R, decrease, low population, noticeable defoliation at Roberts Creek and Lund.
1964-66	Scarce.

Year	Remarks
1967	West Vancouver, light defoliation of D and sP at Pt. Atkinson Lighthouse Park, elsewhere common in small numbers.
1968	White Rock along shoreline to Britannia, from Powell R to Lund and on Texada I, light to severe defoliation of D, wH, sP and wC. Most severe defoliation occurred between Horseshoe Bay and Britannia where up to 8 m of D and 3 m of wH upper crowns were stripped. Larvae were common as far east as Abbotsford.
1969	Scarce, population may have been killed as a result of low winter temperatures.
1970-75	Populations low and scattered.
1976-81	Not mentioned in reports, presumably scarce.

Forest tent caterpillar, Malacosoma disstria

A colonial defoliator of a wide variety of deciduous trees and shrubs. The preferred hosts in the Mainland Section are red alder, black cottonwood and willow. Two favored hosts in interior B.C., trembling aspen and white birch, have a limited distribution in the Vancouver Forest Region. Damage usually results only a reduced tree growth, but repeated defoliation may cause the death of limbs. Defoliation is conspicuous in June. No infestations have been reported from west of Howe Sound.

Year	Remarks
1935	Pemberton Meadows, numerous larvae in old (1932-34) satin moth infestation.
1936-57	Rarely mentioned in reports, presumably at low population levels.
1958	1. 30 km N of Pemberton, infestation 6 km long. 2. Delta, Surrey and Langley municipalities, infestation covering 300 km^2, light to heavy defoliation of Al, bCo, W.
1959	Infestations subsided.
1960-61	Ladner to Abbotsford, light to severe defoliation, in association with the western tent caterpillar.
1962	Ladner to Abbotsford, continued infestation, also at Pitt Meadows.
1963	Populations decreased.
1964-67	Scarce.
1968	Fraser Mills to Port Mann, 60% defoliation of 80 ha of bCo, rAl, W.
1969	Fraser Mills, infestation increased to 100 ha (50-60% defoliation), scarce elsewhere. Satin moth larvae were commonly found in association with forest tent caterpillars at Fraser Mills.
1970-75	Not mentioned in reports.
1976-81	Not found.

Western tent caterpillar, Malacosoma californicum pluviale

A colonial defoliator of alder and willow plus a variety of small trees and shrubs. Damage usually results only in reduced tree growth. Commonly found throughout the Mainland Section of the Vancouver Forest Region.

Year	Remarks
1937	Mission and Sumas districts, small infestations.
1938	Mission and Sumas, infestations subsided.
1939	Vancouver and district, severe infestations.
1940-45	Not mentioned in reports, presumably at low population levels.
1946	Thormanby I, severe infestations.
1947	Texada I, 10 km^2 of defoliation at Shelter Pt, common in Powell R area. Small infestation on rAl at mouth of Capilano R.
1948-52	Scarce.
1953	Pitt Meadows, 25 km^2 of defoliation.
1954	Pitt Meadows, 25 km^2 plus a small infestation at Lindell Beach (Cultus L). Severe defoliation on Bowen I and at Gibsons Landing.
1955-56	Low populations in all areas.
1957-59	Scarce.
1960-61	Ladner to Abbotsford, light to severe defoliation in association with forest tent caterpillar.
1962	Ladner to Albion, light defoliation.
1963	Low populations.
1964-66	Scarce.
1967	Texada I, common
1968	White Rock to Britannia, severe defoliation, especially north of Horseshoe Bay, main host was rAl. Powell R area, moderate defoliation.

Year	Remarks
1969	White Rock to Britannia and from Howe Sound to Powell R, very severe defoliation in a 3 to 5 km wide coastal strip.
1970	Infestations collapsed from action of polyhedral virus. Low populations along Howe Sound and Galiano I.
1971	Scattered tents along Capilano R and in West Vancouver.
1972	Low population along Chapman Cr Road.
1973	Occasional tents near Squamish and along Silver-Skagit Road.
1974	Light defoliation of scattered trees along Coquihalla R.
1975	Not found.
1976	Moderate to severe defoliation of rAl from Port Melon to Gibsons Ldg.
1977-81	Not mentioned in reports.

Fall webworm, Hyphantria cunea

A widespread colonial defoliator of deciduous trees in southern B.C., of which alder, cottonwood, birch and willow are the most important forest hosts. Not considered an economically important pest, although entire trees may occasionally be defoliated. Damage is most conspicuous late in summer and characterized by skeletonized, shrivelled brown leaves encased in webbing.

Year	Remarks
1935-38	Lower Fraser Valley, abundant, total defoliation of roadside Al and wB.
1939	New Westminster area, numerous webs on Al.
1940-46	Not mentioned in reports, presumably low population.
1947	Agassiz Mtn, severe defoliation.
1948	Ladner to Hope, light defoliation.
1949-50	Scarce.
1951	Increase, but low population.
1952	Fraser Valley, prevalent.
1953-55	Low populations.
1956	Increase, but generally low populations.
1957	Fraser Valley, increase, most severe defoliation at Chilliwack.
1958	Fraser Valley, moderate population.
1959	Ladner to Hope, scattered infestations on south side of Fraser R. Moderate defoliation at Powell L.
1960	Ladner to Hope, increased defoliation, most severe at Pierdonville, Cultus L and Yarrow. Common on Sechelt Peninsula.
1961	Fraser Valley, increase, also at Yale and Harrison L.
1962	Fraser Valley, decrease. Scattered infestations from Howe Sound to Lund, 50 to 100% of alders between Sakinaw and Ruby lakes were defoliated.

Year	Remarks
1963	Fraser Valley, decrease. Howe to Hothan sounds and Jervis and Sechelt inlets, common, most severe defoliation along east shore of Ruby L.
1964	Fraser Valley, further decrease. Sechelt Peninsula, only light defoliation.
1965	Sechelt Peninsula and Fraser Valley, low in general, increase at Chilliwack and Boundary Bay.
1966	Sechelt Peninsula, scarce. Fraser Valley, increase, still moderately low population.
1967	Fraser Valley, population remained moderately low, increase from Harrison Hot Springs to Green Point. Sechelt Peninsula, scarce.
1968	Fraser Valley, increase, common. Severe defoliation in Tsawwassen and Beach Grove areas. Light population from Pemberton to D'Arcy and on the Sechelt Peninsula.
1969	Fraser Valley, increase, especially on bCo, Abbotsford to Chilliwack. Sechelt Peninsula, low population.
1970	Moderate to severe defoliation of Al between Yarrow and Rosedale and from Haney to Harrison.
1971	High populations between Yarrow and Agassiz, lower numbers from Haney to West Vancouver and Squamish.
1972	Moderate populations near Yarrow.
1973	Lower populations in Fraser Valley.
1974-75	Very low populations.
1976-79	Not mentioned in reports.
1980	Common in Fraser Valley and in Agassiz-Harrison Lake area. No extensive defoliation.
1981	Moderate populations from Howe Sd to Vancouver-Hope-Nahatlatch Lake and from Howe Sd to Pemberton-Lillooet Lake. Highest populations along east side of Lillooet Lake but no extensive defoliation occurred.

Satin moth, Stilpnotia salicis

An introduced species, first found in B.C. in 1920, defoliating Lombardy poplars in New Westminster, (later, the original source of introduction was assumed to have been Vancouver in 1919 or earlier). In addition to exotic poplars, black cottonwood, trembling aspen and willow are attacked. Small numbers of aspen have been killed after repeated attacks.

Year	Remarks
1920-23	Vancouver and New Westminster, defoliation occurred only on introduced poplars including Lombardy, black, white and Carolina.
1924-28	Distribution extended as far east as Chilliwack causing up to total defoliation of bCo, tA and W.
1929-32	Boundary of infestations extended from Powell R to Yale and into the Pemberton Valley.
1933	Fraser Canyon, extended to Keefers. Pemberton Meadows, continued defoliation.
1934	Pemberton Meadows, continued defoliation.
1935	Scarce, minor defoliation of poplars at Point Grey.
1936	Scarce.
1937	Sumas Prairie, small infestations on W.
1938	Vancouver and district, light attacks.
1939-40	Not mentioned in reports, presumably scarce.
1941	Lower Fraser Valley, small populations.
1942-60	Not mentioned in reports.
1961	Haney and Pierdonville, small infestations.
1962-66	Not mentioned in reports.
1967	Scarce.
1968	Langley, small infestation on white poplar.

Year	Remarks
1969	Langley and Ladner, small infestations on white poplar. Fraser Mills, numerous larvae on bCo and W in association with forest tent caterpillar.
1970-72	Not mentioned in reports.
1973	Adults in flight at Birkenhead L.
1974	Severe defoliation of about 1 ha of bCo at Birkenhead L.
1975	Birkenhead L infestation expanded into two small areas of defoliation along the lake. The parasite Apanteles solitarius was present in the population. Small areas of defoliation of deciduous trees at Meager and Capricorn creeks (Lillooet R tributaries) were attributed to satin moth.
1976-81	Not found.

Conifer sawflies, Neodiprion spp.

These sawflies are suspected of causing mortality in the 1920's and 30's on the Queen Charlotte Islands. Since then, however, no mortality has been recorded even during periods of large populations. Attacks most conifers, but particularly western hemlock and amabilis fir in the Mainland Section.

Year	Remarks
1947	Up to 35 larvae per collection from North Vancouver to Rosedale.
1948	Collections of 92 larvae at Dog Mtn, 31 in Indian R, 29 near Alouette L and 17 in Capilano R Valley. Hosts unknown.
1949	Common but low populations, highest on Mt. Seymour.
1950	Moderately high populations from Drury Inlet to Redonda Islands and from Howe Sound to Stave L. The largest collections contained 170 larvae at Whonock and Chilliwack.
1951	Low populations.
1952	Low populations.
1953	Increase, largest collections were 251 at Woodfibre, 129 at Vancouver Bay and 108 at Halfmoon Bay.
1954	SW of Jones L, small infestations on wH and aF.
1955	Common but low populations, Jones L infestations subsided.
1956	Increase but low; avg 72 larvae on lP from Owl Cr to D'Arcy.
1957	Low populations.
1958	Low, some defoliation at Lorenzetta Cr.
1959	No defoliation reported.
1960	Increase, 11 collections in Sechelt Peninsula, avg 382 larvae. 2.5 km^2 of lP defoliated NW of Chilliwack L.
1961	Decline but common. Infestation near Chilliwack L subsided.
1962	Common but low, 116 larvae on wH at Ruby Cr, 54 on aF in Chilliwack R Valley.

Year	Remarks
1963	Low populations.
1964	Low, 73 larvae on wH at Mowhokam Cr (Boston Bar).
1965	Low populations.
1966	Low populations.
1967	Increase but generally low.
1968	Increase all areas. Small amounts of defoliation on wH and aF east of Hope and at Furry Cr, 300-400 larvae per collection.
1969	Hope Slide, Furry and Raffuse creeks, light defoliation of wH and aF, 200+ larvae per collection.
1970	One collection of more than 800 larvae at Woodfibre.
1971-79	Low populations.
1980-81	Common in beating samples from coniferous hosts throughout Mainland section but only in low numbers.

Striped alder sawfly, Hemichroa crocea

Introduced in B.C., presumably between 1920 and 1925. Larvae feed in colonies, skeletonizing entire leaves. There may be two broods per year in coastal areas. Suspected of causing limited mortality of alders.

Year	Remarks
1930	Rosedale, small numbers of alders defoliated.
1931	Rosedale, increased defoliation. Stanley Park, severe defoliation of small patches of rAl.
1932	Rosedale, infestation increased to 1 km. Stanley Park, severe defoliation of rAl.
1933-36	Lower Fraser Valley, extensive infestations, particularly in the vicinity of Abbotsford.
1937	Lower Fraser Valley, continued defoliation. Powell R, several hundred hectares of defoliation at Townsite.
1938-46	Not mentioned in reports, presumably infestations continued at a reduced level.
1947	Grouse Mtn, Cultus L, prevalent but less numerous than in last few years.
1948	Fraser Valley, low populations. Bute Inlet, 80 to 100% defoliation.
1949	Powell R and along the shores of Powell L, 75% defoliation; 50 to 80% from Stillwater to Lund and at Mowat Bay on Texada I, Fraser Valley, low populations.
1950	Powell R to Lund, high populations. Fraser Valley, scarce.
1951	Powell R to Lund, decline. Fraser Valley, scarce.
1952	Powell R, small localized infestations. Fraser Valley, scarce.
1953	Scarce.
1954	Fraser Valley, increase, avg 34 larvae per collection at Bridal Falls and Seymour R.
1955	Fraser Valley, 24 ha infestation 2 km E of Yarrow.

Year	Remarks
1956	Barnet to Port Coquitlam, Ioco and Buntzen L, Deep Cove, Lynnmour and Seymour Mtn up to 330 m elevation, 325 km^2 of severe defoliation.
1957	North Vancouver, subsiding. Still pockets of defoliation in Coquitlam Valley and small outbreak in Stanley Park at Brockton Point.
1958	Coquitlam Valley, continued but decreased defoliation. Small populations in Mahon Park (N. Van.), Brockton Point, Capilano Indian Reserve and Garibaldi Park (Haney).
1959	Haney, several small infestations. Scarce in other areas.
1960	Ioco and vicinity, near Westview and along Alice L Road (Sechelt Peninsula), moderate defoliation in small infestations.
1961	Fraser Valley and Sechelt Peninsula, populations declined.
1962-69	Extremely scarce.
1970-75	Not mentioned in reports.
1976	This sawfly was suspected of causing defoliation of alder near Brackindale, north of Squamish but no larvae were collected to confirm this. Alder sawfly severely defoliated rA in Saltspring and Vancouver Island.
1977	No defoliation recorded on the Mainland but some did occur in localized areas on Saltspring and Vancouver Islands.
1978	Infestations continued.
1979	Not mentioned in reports; infestations presumably collapsed.
1980-81	Not recorded.

Pine butterfly, Neophasia menapia

Has caused extensive mortality of ponderosa pine in the northwestern United States. Large populations have occurred on Douglas-fir in coastal B.C. and have caused some defoliation in the Vancouver Island Section. Larval populations are difficult to detect since they feed in the upper crowns of mature trees. Most reports are based on the observation of butterfly flights.

Year	Remarks
1938	Large butterfly flight noted near Squamish.
1939-44	Not mentioned in reports.
1945	Numerous adults noted in Seymour R watershed.
1946-62	Not mentioned in reports.
1963	Butterfly flight reported in Squamish R Valley.
1964-67	Not mentioned in reports.
1968	Butterfly flights reported from Fir and Hornet creeks, tributaries of Big Silver Cr.
1969	No butterfly flights observed.
1970-81	No populations recorded on Mainland.

Douglas-fir tussock moth, Orgyia pseudotsugata

An important defoliator in the Interior, this tussock moth is not normally found in the coastal areas. In the 1970's, a small outbreak occurred in the Fraser Valley with moderate to severe defoliation for one year. The host is primarily Douglas-fir but the insect has been found on western hemlock, western larch, spruce and pondrosa pine.

Year	Remarks
1971	Larvae numerous on scattered Douglas-firs at Abbotsford and Clearbrook; moderate to severe defoliation at Clearbrook. Some larvae infected with polyhedral virus.
1972	Infestation continued. Defoliation about the same in Clearbrook and lighter as far west as Surrey. Some top-kill in Abbotsford and Clearbrook. Polyhedral virus killed some larvae. Egg masses collected in the fall were heavily parasitized.
1973	Infestation collapsed. A maximum of two larvae per sample at Clearbrook.
1974-75	No larvae collected.
1976	Low numbers of adults were caught in flight traps at Clearbrook and Hope.
1977	Not mentioned in reports.
1978	Low numbers of male adults caught in flight traps at Boston Bar, Alexandria and Hope; no defoliation recorded and no larvae found.
1979	Not mentioned in reports.
1980	No defoliation recorded and no larvae found. Flight traps at Silver-Skagit River caught only three adults; traps at North Vancouver, Cultus Lake, Sechelt caught none.
1981	Not found.

SUCKING INSECTS

Balsam woolly aphid, Adelges piceae

An introduced species, its presence in B.C. was verified in 1958. Indications are that it had been present since at least 1950. Amabilis fir is the main host in the Mainland section, and occasionally grand and alpine fir.

Year	Remarks
1958	Known to occur on the east side of Howe Sound, North and West Vancouver and in New Westminster.
1959	Known infested area increased to include the west side of Howe Sound (Potlatch Cr, Rainy R, Dakota and Roberts creeks). 3,900 dead and dying trees were counted in the Mainland area, the most severe mortality occurred at Cypress Cr where 2,000 aF were killed.
1960	Known range expanded to the east to include Indian Arm and Madeira Park to the west; 5,300 dead and dying trees were counted.
1961	Known range expanded to include Indian R Valley and Coquitlam L; 8,300 dead and dying trees were counted, the most severe mortality occurring in Cypress and Seymour Creek and Indian R valleys. There were over 200 attacked trees at Rainy R, Woodfibre Cr, Mill Cr, Capilano R and Coquitlam L.
1962	No expansion recorded; 5,800 dead and dying trees were counted.
1963	Known range expanded to include the east side of Jervis and Sechelt inlets and Ashlu Cr and Mamquam R Valley.
1964	Decrease in the number of red-topped balsam trees in Jervis and Sechelt inlets, Howe Sound and the Capilano R Valley. Distribution was unchanged.
1965	Known area of infestation unchanged.
1966	Eastward extension of attack at Widgeon Cr, Haney, Langley, Agassiz, Popkum and Tretheway Cr.
1967	New infestations found in Upper Stave R Valley and at Tretheway and Bremner creeks, where alF as well as aF was infested.

Year	Remarks
1968	Known boundaries unchanged. 800 red-topped aF in the Indian R Valley.
1969	Infestation area extended slightly northward in the Pitt R Valley (Boise Cr). Largest concentrations of dying trees were in the Seymour, Indian and Coquitlam R valleys.
1970	Tree mortality continued in Stawamus, Indian, Seymour and Coquitlam R valleys.
1971	No change recorded in infestation boundaries.
1972	First occurrence recorded on Pender I; two gF trees attacked.
1973	No change recorded.
1974	Aphid was collected in Garibaldi Park.
1975	The known distribution was expanded to Mt. Elphinstone near Gibsons Landing and Lyons L near Halfmoon Bay. Areas of dead Abies spp. S of Cheakamus L, at Rutherford Cr and along the upper Lillooet R indicated suspect areas for the insect.
1976-81	Not mentioned in reports.

Cooley spruce gall aphid, Adelges cooleyi

This insect causes cone-shaped galls on spruce twigs. The galls are of little importance under normal forest conditions but in nurseries, plantations and on ornamental trees they are of consequence because they kill branch tips and tend to stunt and deform trees. The insect has a complicated life cycle involving two hosts, Douglas-fir and spruce.

Year	Remarks
1954-58	Not mentioned in reports.
1959	Common on D and sS.
1960	Severe infestation on D natural reproduction and planted trees in Stanley Park, on some trees 100% of needles attacked. Also severe at Tenas Lake and NW of Lillooet Lake. Moderate to severe attacks at UBC Forest near Haney.
1961	Galls collected from all areas for distribution records; new galls on spruce were scarce but light populations on D caused some needle distortion.
1962-68	Not mentioned in reports.
1969	Severe attacks on young D at Powell R; lighter attacks at Bute, Toba and Jervis inlets.
1970	Common throughout Region.
1971	Light attacks on D seedlings along Seymour R.
1972	Moderate attacks in D plantations in Fraser Valley.
1973	Moderate to severe infestations along Silver-Skagit, Seymour and Capilano rivers; up to 100% of needles attacked in many areas. Damage reported by Christmas tree growers in Fraser Valley.
1974-79	Not mentioned in mainland reports.
1980	Some damage in D plantations at Bute Inlet.
1981	Not recorded.

Spruce aphid, Elatobium abietinum

Sitka spruce is a minor species in the Mainland Section. No serious damage has been found in forest sites although shoreline and exposed trees occasionally suffer moderate defoliation. Tree mortality has been confined to Sitka and exotic spruce in windbreaks and residential gardens in the Fraser Valley from Lander to Chilliwack.

Year	Remarks
1938	A Vancouver Golf Course. Severe outbreak on several hundred young sS.
1939	Vancouver, injured ornamental spruce.
1940	Vancouver, increase, numerous.
1954	Vancouver, on blue spruce, confined to City and Stanley Park.
1955	Vancouver only.
1956	Vancouver, decrease.
1958	Deep Cove to Horseshoe Bay and Lower Fraser Valley to Chilliwack, moderate infestation.
1959	Fraser Valley, subsided.
1961	Fraser Valley, trees recovered after 1958 attack. Severe defoliation on Texada and Gilford islands and along the south side of Knight Inlet.
1962-63	Fraser Valley, low.
1964	Fraser Valley, occasional severe attacks. Light damage to shoreline sS at Deserted Bay, Port Neville and Loughborough Inlet.
1965	Fraser Valley, increase, some mortality. Light damage at Port Neville.
1966	Fraser Valley, severe defoliation.
1967	Fraser Valley, increase, mortality at Yarrow, Chilliwack, Sumas, Langley, Ladner.
1968	Fraser Valley, decrease, more mortality from previous attacks, North Vancouver, Yarrow, Chilliwack, Langley, Ladner.

Year	Remarks
1969	Decrease, very scarce, population may have been reduced by the cold winter temperatures. The approximate number of semi-mature shelterbelt spruce killed between 1964-68 was: Ladner, 20; Cloverdale to Langley, 10; Clearbrook, 4; Sumas Prairie, 38 and Chilliwack, 10.
1970	Light to moderate defoliation of shelterbelt spruce from Tsawwassen to Sumas and Mission to Harrison.
1971-72	Not mentioned in reports.
1973	Occasional tree damaged on lower Mainland.
1974-81	Not mentioned in mainland reports.

BARK BEETLES

Mountain pine beetle, Dendroctonus ponderosae

The main host in the Mainland Section is western white pine. There are a few extensive stands of lodgepole pine in areas that border the interior of B.C., e.g. the Klinaklini, Cheakamus, Lillooet and Skagit R drainages. In other areas, lodgepole or shore pine is confined to small pockets or scattered individuals. Ponderosa pine is a minor species and is restricted to the D'Arcy and Boston Bar areas.

Year	Remarks
1914-45	No serious outbreaks reported.
1946-59	More detailed annual surveys commenced in this period. The surveys showed that tree mortality was quite extensive in the Skagit R Valley and in North Shore Mountains in previous years, but numbers of trees were not recorded.
1960	Extensive mortality of wwP in the Squamish R Valley and on Sechelt Peninsula.
1961	450 red-topped wwP at Birkenhead L, 90 wwP at Gray Cr (Sechelt Inlet).
1962	Counts of red-topped wwP were: Skagit Valley, 1,600; Nahatlatch Valley, 420 and 100+ near Alta L. The Skagit and Nahatlatch infestations included some lP mortality.
1963	The Skagit (no count) and Nahatlatch (100 red-tops counted) infestations decreased. New attacks on wwP were recorded at: Soo R, 75; Birkenhead L, 105 and 175 at Blackwater L.
1964	Skagit R Valley, 400 wwP and a small number of lP red-tops were counted. Approximately 50 immature wwP at Caran Ridge (Sechelt Peninsula) were attacked.
1965	An estimated 1,000 wwP were attacked at Scuzzy Cr, 500 in upper Anderson R valley and 200 in upper Skagit Valley. Only a few new attacks on wwP and lP were noted in lower Skagit Valley.
1966	Low populations, small numbers of current attack were noted in Scuzzy, Anderson and Skagit valleys.
1967	Low populations, an estimated 35 red-topped wwP east of Birkenhead L constituted the only known attack.

Year	Remarks
1968	Low populations, no attacks on wwP recorded. 25 pP near d'Arcy were killed; these trees were on the perimeter of a larger infestation in the Kamloops Forest Region.
1969	Low populations. No additional attacks on pP noted. Scattered small pockets of wwP were beetle-killed in the Glacier-Fire lakes area NW of Harrison L.
1970	Not mentioned in reports.
1971	50 wwP recorded at Birkenhead L and 200 lP at Haylmore Cr.
1972	1,325 wwP recorded in groups of up to 500 trees in Lillooet L area and along Anderson R in the Fraser Canyon.
1973	2,930 wwP tallied, most of which were along Kookipi Cr, a tributary of Nahatlatch R.
1974	1,955 wwP killed in the Birkenhead L - Pemberton area and Anderson R, Kookipi and Scuzzy creeks in the Fraser Canyon. Extensive mortality of lP occurred in the Klinaklini R drainage where 10,300 red-tops were estimated. Numerous old, dead lP indicated tree mortality was occurring for some years. A group of 400 lP was noted at Haylmore Cr.
1975	3,595 wwP counted in the following areas: Birkenhead L - Blackwater Cr, Lillooet L, Sumallo R, Skagit R, Nahatlatch L and R and East Anderson R. Surveys along Klinaklini R disclosed an estimated 40,000 red-topped lP; 300 lP recorded at Haylmore Cr.
1976	18,000 killed lP recorded along the Klinaklini R from Klinaklini L to Knot Cr and from Knot Cr south for 4 km along the valley; 250 lP counted at Haylmore Cr.
1977	4,000 dead lP trees recorded on 2 560 ha in Klinaklini R drainage; 300 lP trees killed at Spruce Cr near Anderson L; scattered groups of wwP trees were killed at Birkenhead L, Skagit and Nahatlatch rivers. Scattered wwP and lP mortality occurred at Mowhokam Cr and Ainslie Cr in the Fraser Canyon.
1978	1,500 killed lP recorded in Klinaklini R drainage, 530 trees at Haylmore and Spruce creeks; 150 scattered wwP killed at Birkenhead L and Joffre Cr; 350 lP killed at Mowhokam Cr.

Year	Remarks
1979	Infestations in Klinaklini R drainage collapsed after killing most of the lP; 25 recently-killed lP were recorded W of Klinaklini L; 1,500 killed lP recorded at Haylmore and Spruce creeks and scattered lP mortality occurred at Spetch Cr in the Pemberton area and at Mowhokam Cr in Fraser Canyon area. wwP mortality occurred at Birkenhead L and at Joffre Cr near Lillooet Lake.
1980	Klinaklini R infestation showed renewed activity, 1200 ha infested. Infestation at Haylmore-Spruce creeks increased to over 100 ha and at Mowhokam Cr to 270 ha. A new 20 ha infestation occurred at Eastgate in Manning Park.
1981	5,000 killed pine trees recorded in more than 1 500 ha at Haylmore, Spruce creeks, Birkenhead L, Specht Cr, Boston Bar, Mowhokam Cr and Eastgate.

Douglas-fir beetle, Dendroctonus pseudotsugae

A periodic pest of mature and overmature Douglas-fir. To date, all serious outbreaks have been confined to the drier portions of the Mainland Section, i.e., Lillooet and Skagit R valleys and Fraser Canyon area.

Year	Remarks
1929	An unpublished report states that, "All serious epidemics subsided in the B.C. coast section" (thus implying that outbreaks occurred in the 1920's, but are unrecorded).
1930-48	No serious infestations reported. 10+ red-tops at White Rock in 1936.
1949	A few trees attacked at Wilson Cr.
1950	A few trees attacked near Lund.
1951	No infestations reported.
1952	Anderson and Skagit R valleys, small patches of beetle-killed trees.
1953	Several new patches of red-tops in Anderson R Valley. Beetles attacking some trees in the Lillooet R Valley, which had been severely defoliated by spruce budworm.
1954	Small infestations near Port Douglas and Tenas L in Lillooet R Valley. Fewer red-tops were noted in Anderson and Silver-Skagit areas.
1955	Further attacks recorded in the Lillooet Valley, near Port Douglas and Roger Cr. Also new attacks in Anderson Valley.
1956	Further attacks in Lillooet Valley, but fewer than in 1955. Only one fresh pocket of red-tops in Anderson Valley.
1957-59	Little beetle activity noted.
1960	Small groups of trees attacked in Anderson, Skagit and Lillooet R valleys. Two small infestations reported on Sechelt Peninsula involving 50 trees near Pender Harbour and 60 at Agamemnon Channel.
1961	200 red-tops in Nahatlatch R Valley, 40 north of Boston Bar and a few in Skagit Valley.

Year	Remarks
1962	135 red-tops in Nahatlatch R Valley, 55 at Ainslie Cr (N of Boston Bar), 27 at North Bend (Chaumox) and 30 in the Silver-Skagit area.
1963	The numbers of red-tops declined, only 85 trees were counted in the Nahatlatch, Boston Bar and North Bend areas.
1964	100 attacked trees in Scuzzy and Stoyoma creeks (near Boston Bar).
1965	No infestations recorded.
1966	40 red-tops counted between Yale and Boston Bar and 30 in the Silver-Skagit area.
1967	Increase in Fraser Canyon to 301 red-tops between Yale and Boston Bar and to 75 in the Silver-Skagit; 25 attacked trees were noted in the Pemberton area.
1968	240 red-tops counted from Yale to Boston Bar. On the east side of Harrison L, 40 trees were attacked at Big Silver Cr and 12 at Cogburn Cr. Twenty trees were attacked at the north end of Lillooet L.
1969	Decrease in attack in the Fraser Canyon area; about 20 trees were noted in the vicinity of Spuzzum. There were 110 red-tops in the Tretheway - Sloquet Creek and Glacier-Fire lakes area NW of Harrison L.
1970	Moderate populations in decked logs at Yale.
1971	Some attacks on windfelled trees at Railroad Cr; 150 red-tops at Spuzzum Cr.
1972	Light attacks on felled trees at Spuzzum Cr and on standing trees along Silver-Skagit Road, where blowdown occurred in winter of 1971-72.
1973	Not mentioned in reports.
1974	200 red-tops recorded in Silver-Skagit Valley.
1975	400 red-tops in Silver-Skagit Valley. Beetle attacks occurred on Douglas-fir trees defoliated during consecutive years of spruce budworm infestations at Railroad Cr, Sumallo R and Haylmore Cr.

Year	Remarks
1976	Total of 435 killed D trees recorded at Railroad, Tenquille, Owl, Rutherford, Uztlius, Snass creeks, Birkenhead L, East Anderson and Skagit rivers. Scattered trees attacked along Chilliwack R Road.
1977	Light attacks in Fraser Canyon and in Pemberton area.
1978	Total of 481 trees killed in Fraser Canyon and Pemberton area.
1979	Occasional recently-killed D trees observed from aerial surveys in Pemberton and Fraser Canyon areas.
1980	Small infestations recorded from Poole Cr to Pemberton and along Fraser R from Boston Bar to Saddle Rock.
1981	Total of 25 red-topped D trees recorded between East Anderson R and Uztlius Cr. Low population of beetles found in decked logs near D'Arcy.

STEM BORERS

Poplar-and-willow borer, Cryptorhynchus lapathi

An introduced pest, first discovered in the Okanagan and Lower Fraser valleys in the 1920's. At the present time, the insect has a wide distribution in southern B.C. and along the Nass and Skeena River valleys. It attacks willows, poplars and alders.

Year	Remarks
1930	Vancouver, first report of damage on the Lower Mainland, but presence of insect known for at least three years.
1933	Vancouver, caused damage to ornamental W in Stanley Park nurseries.
1934	Surrey, W attacked at Green Timbers.
1935	Vancouver area parks, additional attacks on W.
1936	Sumas Prairie, attacking native W.
1937	Sumas Prairie, thousands of W stems killed. Green Timbers, infestation continues.
1938	Green Timbers, additional attacks on W.
1939	Vancouver area, first record of attack on bCo. Continued attacks on W.
1940	Lower Fraser Valley, common.
1941-46	Not mentioned in reports.
1947	Fraser Valley, new locality records at Pitt L, Chilliwack and Yale.
1948	Kawkawa L (Hope), extensive damage of W in 2.5 km^2, some tree mortality was recorded. W in Seymour Cr Valley severely infested.
1949	Alouette L and Chehalis R, new locality records.
1950	Not mentioned in reports.
1951	Elk Mtn (Chilliwack) and Kawkawa L, W severely infested.

Year	Remarks
1952-57	Not mentioned in reports, but probably common in the Fraser Valley.
1958	Common on W at Slesse Cr, Agassiz, Silverhope Cr to Ross L, Hope, Anderson R and Fraser Canyon area; bCo north of Port Douglas severely infested.
1959	Fraser Valley and along Howe Sound, attacks on W common, severe from Mission to Rosedale; bCo infested in UBC Forest, Haney.
1960	Fraser Valley and Howe Sound west to Madeira Park, common on W.
1961	Lower Mainland, common on W; bCo infested in Skagit R Valley.
1962	Chilliwack R Valley, attacks decreased.
1963	Fraser Valley, severe attacks reported.
1964-69	Fraser Valley, light attacks only.
1970-73	Low populations.
1974	Severe infestation of bCo shade trees at Anderson Lake fisheries station.
1975	Severe mortality of W on 20 to 40 ha of clear cut along Mamquam R. Infested trees common from Boston Bar to Vancouver and along the Sechelt Peninsula.
1976	Mortality of small diameter W common in southern part of the Mainland section.
1977-81	Not mentioned in reports.

TERMINAL BORERS

European pine shoot moth, Rhyacionia buoliana

An introduced species, first discovered in Victoria in 1927. Its distribution has since extended to include southern Vancouver Island, the Lower Fraser Valley, Kamloops and the Okanagan Valley. Most exotic two- and three-needle pines are attacked, plus lodgepole and ponderosa pines in gardens and parks. No attacks have been found in native pines in forest sites.

Year	Remarks
1938	Vancouver gardens and Stanley Park, 1P attacked. First record on the Mainland.
1939	Vancouver, infestation on Scots pine, controlled artificially.
1959	Greater Vancouver area, light attacks on Mugho and Austrian pines.
1960	Greater Vancouver area, additional light attacks.
1964	Greater Vancouver area, lodgepole, Mugho, Austrian, Scots and red pines attacked in residential gardens.
1965	Vancouver to Chilliwack, infested pines in gardens and parks.
1966	Vancouver and Yarrow, severe attacks; elsewhere, light.
1967	Vancouver to Chilliwack, additional attacks. Especially severe on exotic and native pines in Vancouver gardens and parks.
1968	Vancouver gardens, high populations on lodgepole, Scots and Mugho pines.
1969	Vancouver area, additional attacks. No tree mortality has been reported but many trees have been so severely disfigured by repeated attacks that they were removed.
1970	Not mentioned in reports.
1971	Some planted trees infested in Vancouver.
1972	Low population. Of 243 trees examined in Vancouver only 2% were infested.

Year	Remarks
1973	Not mentioned in reports.
1974	Flight traps showed moderate to high populations in Vancouver. Plant Protection Branch found infested trees in nurseries at Chilliwack and Langley.
1975-81	Populations continued in Vancouver area.

PITCH MOTHS

Sequoia pitch moth, Synanthedon sequoiae

Attacks small groups or individual trees, occasionally causing tree mortality. After repeated attacks, larval tunnelling may girdle the bole.

Year	Remarks
1958	Common on lP from Lillooet L to Port Douglas.
1959	Severe infestations in pP plantations at Green Timbers and Alouette L.
1960	lP severely infested north of Cheekeye in Cheakamus R valley.
1961-66	Not mentioned in reports.
1967	lP and pP in Williams Park, Langley, were severely infested.
1968	Numerous attacks on lP and pP north of Boston Bar, but no tree mortality.
1969	No new attacks recorded.
1970-81	Not mentioned in reports.

LEAF BEETLES

Pacific willow leaf beetle, Pyrrhalta carbo
Alder leaf beetle, Pyrrhalta punctipennis

Common skeletonizers of leaves of alder, willow, poplar, birch and undergrowth shrubs, often resulting in severe defoliation over a large area. No tree mortality has been recorded. Both species have a widespread distribution in B.C., but in the Mainland Section P. carbo has caused the most serious defoliation in alder stands.

Year	Remarks
1934	P. carbo, South Vancouver and Stanley Park, small infestations on W.
1935-46	Not mentioned in reports.
1947	P. carbo, Britannia Beach, New Westminster, Maple Ridge Park, severe defoliation on rAl. Powell R, defoliation of W. P. punctipennis, Cultus L, abundant on rAl.
1948	P. carbo, Vancouver, Surrey, Cultus L, noticeable defoliation of W. P. punctipennis, Howe Sound, abundant on rAl.
1949	P. carbo, Chilliwack, common.
1950-56	Not mentioned in reports.
1957	P. carbo, Lake Erroch to Morris Cr Valley, Norrish R Valley and Seabird I, abundant.
1958	P. punctipennis, Coquitlam R Valley and Flood, moderate defoliation.
1959	P. carbo, Vancouver to Bute Inlet, severe defoliation of W.
1960-66	Not mentioned in reports.
1967	P. carbo, Harrison and Hope B.C.F.S. Ranger Districts, widespread severe defoliation of rAl.
1968	P. carbo, east side of Harrison L, extensive severe defoliation of rAl.

Year	Remarks
1969	P. carbo, east side of Harrison L, extensive moderate defoliation of rAl. Saltery Bay to Lund, moderate defoliation of W. P. punctipennis, Chilliwack, moderate defoliation of mature bCo.
1970	P. carbo; defoliation of rAl and bCo at Harrison L, Squamish R and at Estero Basin near Bute Inlet.
1971	P. carbo; severe defoliation of rAl along power line near Squamish.
1972	P. punctipennis; light defoliation of rAl along Chapman Cr road.
1973	P. carbo; moderate defoliation or roadside W along Capilano R.
1974	Not mentioned in reports.
1975	P. carbo; moderate population on W at Norrish Cr. P. punctipennis; present on fireweed along Mamquam R.
1976-81	Not mentioned in reports.

Alder flea beetle, Altica ambiens

A common and widely distributed skeletonizer of alder leaves; the resulting defoliation is not considered to be serious.

Year	Remarks
1947	Langley, light skeletonizing on rAl.
1948	Upper Pitt R, West Vancouver, defoliation of rAl.
1949-57	Not mentioned in reports.
1958	Coquitlam R Valley, moderate defoliation.
1959-66	Not mentioned in reports.
1967-69	Fraser Valley, common, moderate defoliation, especially in the Chilliwack B.C.F.S. Ranger District.
1970-81	Not mentioned in reports.

APPENDIX I. HOST TREE ABBREVIATIONS

Abbreviations	Common Name
eS	Engelmann spruce
wS	White spruce
bS	Black spruce
sS	Sitka spruce
alF	Alpine fir
gF	Grand fir
aF	Amabilis fir
D	Douglas-fir
wL	Western larch
aL	Alpine larch
tL	Tamarack
wC	Western red cedar
yC	Yellow cedar
roJ	Rocky Mt. juniper
wH	Western hemlock
mH	Mountain hemlock
lP	Lodgepole pine
sP	Shore pine
pP	Ponderosa pine
wwP	Western white pine
wbP	Whitebark pine
tA	Trembling aspen
bPO	Balsam poplar
bCo	Black cottonwood
Al	Alder general
B	Birch general
M	Maple general
W	Willow general
O	Oak general

VANCOUVER ISLAND SECTION

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INTRODUCTION

Widespread sampling of insect populations on Vancouver Island began in 1946, with the expansion of the Forest Insect and Disease Survey. Before 1946, surveillance was mainly confined to areas accessible by road; therefore, reports of infestations in remote areas were sporadic. Observations have improved due to expanded road systems and through the use of boats and aircraft in detection of forest pest problems.

Logging started on a small scale on southern Vancouver Island around 1850 and progressively extended and increased northward along the east coast in low elevation areas. By 1900 much of the mature timber was logged and some of the land converted to agricultural or commercial purposes or was reserved for parks, watershed use, Indian reserves and a few private timber holdings. Major river valleys logged in the early 1900's, were left for forestry use; they reseeded naturally. Logging took place in the lowland fringe along the northeast coast in the early 1900's, and in the Alberni area prior to 1900. To-day most remaining mature timber is confined to high elevations, with the exception of some areas along the west coast.

The higher elevation mature forests are currently more susceptible to insect attack than the lowland immature forests. Second-growth timber in river valleys and lowland areas logged prior to and shortly after 1900, will become increasingly susceptible to insect attack as they reach maturity.

In summary, major forest insect outbreaks on Vancouver Island were as follows: Western hemlock looper infestations occurred in mature coniferous forests in the late 1920's Neroutsos Inlet; 1943-45 south-west Vancouver Island from the San Juan River mouth to Alberni.

Green-striped forest looper infestations in hemlock-cedar forests, 1960 between Tofino Inlet and Brooks Peninsula; 1968-69 in the Quatsino region from Coal Harbour to the south end of Neroutsos Inlet and east of Victoria Lake.

Three major infestations of blackheaded budworm occurred in western hemlock stands, 1943-44 Holberg-Port Hardy-Port Alice, Tofino, Sayward and Cowichan Lake; 1953-57 Port Renfrew-Port Alberni; 1969-73 west coast and north end Vancouver Island.

Balsam woolly aphid has caused annual mortality of grand and amabilis fir on southern Vancouver Island since its presence was noted in the late 1950's.

Douglas-fir beetle has caused tree mortality in mature Douglas-fir stands usually after initial buildup in logging slash, blowdown, trees predisposed by fire or defoliators. Infestations 1914 Cowichan Lake and Campbell River; 1939-40 Comox Lake and Chemainus River valley; 1948 Caycuse River; 1954-56 Nimpkish River.

Mountain pine beetle has caused tree mortality to western white pine usually to trees predisposed by white pine blister rust. Widespread tree mortality occurred from the mid-1940's through the 1950's and 1960's.

Information in this report was compiled from Annual District Reports, Forest Insect and Disease Survey, British Columbia 1936-1981, unpublished reports 1929-1981, and a variety of published histories of insects in British Columbia.

DEFOLIATORS

Western hemlock looper, Lambdina fiscellaria lugubrosa

In earlier times this is reported to have been the most important insect of the defoliator group in coastal B.C. On Vancouver Island, the hemlock looper was reported at Coal Harbour in 1925, and the first recorded serious defoliation occurred along Neroutsos Inlet in the late 1920's. Moth flights were observed in 1943 at Cowichan Lake and by 1945 an infestation extended over 2 300 km^2 on south-west Vancouver Island from the San Juan River mouth to Alberni. No noteworthy infestations have occurred on the Island since. Western hemlock is the preferred host but, during outbreaks, western red cedar, amabilis fir, Sitka spruce and Douglas-fir are also defoliated.

Year	Remarks
1913-14	"...the looper defoliated and killed a considerable area of western hemlock on Vancouver Island." No details.
1925-27	Quatsino region, severe defoliation and mortality of wH in a 9 km strip along west side of Neroutsos Inlet.
1928-30	Quatsino region, no evidence of larvae. Continued mortality of wH resulting from defoliation.
1931-42	Larvae scarce.
1943	Cowichan L, moth flights noted but no defoliation recorded.
1944	Moderate populations in Lens Cr and Quatsino region, serious defoliation along west fork of the Gordon R.
1945-46	Infestation on S.W. Vancouver I. from San Juan R north to Alberni, covering 2 300 km^2; 360 km^2 severely defoliated.
	1. Caycuse R valley, severe defoliation.
	2. Nitinat valley, 400 million cu. ft. of timber infested; areas sprayed.
	3. Klanawa R valley, infestation covers 31 km^2 up to 100% mortality of wH in scattered areas.

Year	Remarks
	4. Further infestation in (a) lower Sarita, very severe; (b) Coleman Cr, severe; (c) Pachena R, moderate.
	5. Burman R, small area of defolaition near mouth. General decrease.
1947	Infestation on S.W. Vancouver I. subsided due to disease and spraying. Infestation still active in Gordon R, upper Nitinat and Poett Nook on Alberni Inlet.
1948-50	Low population.
1951	Low population. One larva per collection along west coast.
1952	Low population.
1953	Low population. One collection of 22 larvae along Nitinat R.
1954	Slight increase.
1955	Low populations.
1956	Low populations; occasional larva in Caycuse, Nitinat, and Sarita R areas.
1957	Low populations; slight increase on northern Vancouver I.
1958	Low populations.
1959	Generally low populations, one or two larvae per sample in the Nimpkish R valley.
1960	Generally low, but moderate population at Dahlstrom Point, on Holberg Inlet. Two collections contained 52 and 54 larvae each.
1961	Low populations, moth flight near Port Eliza, but no eggs found in fall.

Year	Remarks
1962	Low populations.
1963-65	Scarce.
1966-68	Low population.
1969	Low population; slight increase.
1970	Slight increase.
1971	Small increase
1972	Low population.
1973-74	Low population.
1975	Not mentioned in reports.
1976	Low populations.
1977-78	Not mentioned in reports.
1979-81	Low populations.

Green-striped forest looper, Melanolophia imitata

A damaging defoliator of coastal hemlock and cedar in fog-belt areas. Douglas-fir, the true firs, spruces and pines are also attacked. There is no record of it having caused tree mortality prior to 1960. An outbreak in 1960 caused some mortality and top-killing along the west coast of Vancouver Island between Tofino Inlet and Brooks Peninsula and on the Queen Charlotte Islands in 1963-64. The most recent infestation, resulting in considerable tree mortality, occurred in 1968-69 in the Quatsino region from Coal Harbour to the south end of Neroutsos Inlet and east of Victoria Lake. Infestations in British Columbia have been characterized by rapid population increases resulting in severe defoliation in scattered isolated areas, followed by the sudden collapse of populations. Before 1949, this insect occurred only sproadically and was not considered to be a significant pest.

Year	Remarks
1949	Common
1950	Common
1951	Increase along west coast V.I. Largest collection was 120 larvae from Effingham Inlet.
1952	Decrease along Effingham Inlet, but increased in Tofino-Bedwell Sound area. Up to 800 larvae in a collection at Barkley Sound, but defoliation light, exceeding 30% in only one small area.
1953	Decrease, low populations.
1954-56	Low population.
1957	Low populations, slight increase.
1958	Increase.
1959	Moderate populations.
1960	Severe defoliation and some tree mortality on 8 000 ha in areas between Tofino Inlet and Brooks Peninsula. Tree mortality totalled 2,400,000 cu ft of western hemlock. Severe defoliation of 2 000 ha occurred at Eelstow Passage (50%), Villaverde I (91%), Bligh I (81%), Chamiss Bay-McKay Cove, Hankin Cove and Yaku Bay.

Year	Remarks
1961	The infestation on the west coast collapsed. Parasitism and a fungus Cordyceps militaris, which infected pupae, were important factors in its decline. Elsewhere, populations at low levels.
1962	Very low populations. Only 4 larvae collected on all of Vancouver I.
1963-66	Low population.
1967	Increase throughout Island.
1968	Light defolition of wH at Victoria L and severe on understory trees on island and in lake. Moderate to high populations along west coast.
1969	Infestation, Quatsino-Port Alice area; severe defoliation of wH over 6 800 ha, moderate on 2 700 ha and light on 4 000 ha. Largest collection contained 1,400 larvae at Julian Cove. Mortality of wH in areas of severe defoliation, specifically Atkins Cove and area near Port Alice, south of pipeline.
1970	Quatsino-Port Alice infestation collapsed. Largest collection contained 1,200 larvae at Atkins Cove. High larval mortality in late instars. Cordyceps militaris important in decline of infestation. Populations elsewhere were low.
1971	Only 4 larvae found on Vancouver I.
1972-73	Scarce.
1974	Decreased populations.
1975-77	Not mentioned in reports.
1978	Low number of larvae in collections taken from Parksville to Courtenay to Port Alberni.
1979	Populations decreased.
1980-81	Low population.

Western blackheaded budworm, Acleris gloverana

The history of the blackheaded budworm in the coastal hemlock forests of British Columbia is one of recurring outbreaks, especially on Vancouver Island. Three known periods of outbreak have occurred: Holberg - Port Hardy - Port Alice southward on the west and east coasts to Tofino and Sayward, respectively, Cowichan Lake area (Cottonwood) 1943-44; Cape Scott - Brooks Peninsula, Sayward 1953-57; Port Renfew - Port Alberni, west coast and north end Vancouver Island 1969-73. In these infestations, parasites and virus diseases along with adverse weather conditions reduced the populations after two or three years and little tree mortality occurred. Western hemlock and amabilis fir are the preferred hosts throughout the Vancouver Island areas although larvae are found commonly on other coniferous hosts such as Douglas-fir, grand fir, Sitka spruce and mountain hemlock.

Year	Remarks
1928	At the head of the Gordon R.
1930	Subsided.
1940	5% defoliation of current growth
1941	Extent and intesity of infestation both increased, also found at Victoria on gF, Courtenay on aF (forbidden Plateau) and Great Central L.
1942	Cottonwood Cr infestation continued. Light defoliation on south side of Great Central Lake.
1943	Infestations at Cottonwood Cr, Great Central L, at higher elevations, increased to cause severe defoliation. Increase of population on North Vancouver I at Quatsino region.
1944	Southwestern Vancouver I, infestation collapsed; northern sector of Vancouver I increased, very severe defoliation near Salmon R at Haihte L causing severe mortality. High populations in the Quatsino Region causing foliage discoloration and top-kill.
1945	Populations collapsed on North Vancouver I.
1946-51	Population at endemic level.
1952	Rising population av 1.8 l/collection

Year	Remarks
1953	Rising population av 4.7 l/collection
1954	Severe spot infestation at Holberg and Beaver Cove. Moderate at Sayward.
1955	Infestation to 4 160 km^2 in Quatsino Region; Shushartie to Port Alice, south to Kyuquot and east to Adam R delta.
1956	Infestation increased to nearly 7 800 km^2 mainly to south and east.
1957	Gradual collapse of infestation during the feeding period, parasitism ranged from 20% to 60% in rearings.
1958	Population at endemic level.
1959-67	Endemic level.
1968	Population increased slightly.
1969	Population increased to moderate infestation levels between Jordan R and Port Alberni.
1970	Population increased; moderate infestation levels light to severe defoliation over 10 000 ha between Jordan R and Port Alberni. One spot infestation east of Port Alice. Egg counts indicate increase for 1971.
1971	Population increased; moderate to severe infestations from north of Nanaimo ls, south to Jordan R and west to Museum Cr, 32 000 ha of moderate to severe defoliation mostly in the Cowichan L and Loss Cr areas; also 32 000 ha light defoliation. Moderate to severe defoliation over 690 ha along both sides of Neroutsos Inlet, and 1 400 ha of light defoliation.
1972	Infestations expanded to 164 000 ha; light defoliation 86 400 ha, moderate - 53 600 and severe 24 000. Severe defoliation of regeneration wH in Port Alice area. Increase occurred mainly on west coast and north end of Island. Egg sampling indicated a decline for S Vancouver Island in 1973.

Year	Remarks
1973	Infestation declined; only 9 040 ha light defoliation in scattered patches from Holberg, southeast to Port Alice, Victoria L, Benson L, and in a new area from Beaver Cove south to Bonanza L. Small pocket light defoliation at Pinder Pass. 10% of wH at Jump Cr have 1.5 - 6 m of top-kill from previous defoliation.
1974	Very low populations, highest at Little Espinosa Inlet.
1975-77	Low populations.
1978	Increased populations from Tofino to Brooks Peninsula. Highest numbers of larvae found at Ououkinsh and Nasparti inlets.
1979	Low populations, highest on Brooks Pen.
1980-81	Low populations.

Western spruce budworm, Choristoneura occidentalis

Spruce budworm outbreaks on Douglas-fir occurred on south Vancouver Island from 1926 to 1930 in the Colwood and Metchosin areas near Victoria, at Maple Bay near Duncan and at Yellow Point and Wellington near Nanaimo. There have been no outbreaks since that time.

Year	Remarks
1926	120 ha near Victoria on Sooke Road (Colwood west), 30% of tree stripped of second and third year needles; 160 ha at Yellow Point and 80 ha on outskirts of Wellington between Brannen L and Long L.
1927	Unchanged from 1926.
1928	Continued activities in same areas. Increment loss at Maple Bay showed evidence of infestations in 1851 to 1856 and 1909 to 1910.
1929	Infestations over 125 km^2 at Victoria, Duncan Nanaimo; most severe defoliation around Thetis L.
1930	Infestation at Victoria expanded to 62 km^2 from Thetis L to Finlayson Arm and Luxton.
1931	Infestation collapsed; no current damage.
1932-49	Low populations prevailed.
1949-71	Low populations prevailed.
1972	Avg 7.8 and 1.5 adults/soolure trap at Thetis L and Green Mtn, respectively.
1973	avg 27 and 4 adults/soolure trap at Thetis L and Green Mtn, respectively.
1974	A few adults in soolure traps at Thetis L, Green Mtn and Fuller L.
1975	Not found on Vancouver Island.
1976	Moderate numbers of adults in soolure traps at Thetis L, Fuller L and Green Mtn.

Year	Remarks
1977-78	Moderate populations of larvae found in D seed orchards at Duncan and on the Saanich Pen.; low number of adults in soolure traps at Thetis L, Fuller L and Green Mtn.
1979	No larvae collected on Vancouver Island but low numbers of adults were caught in soolure traps near Thetis Lake.
1980	Very low numbers of adults in soolure traps at Green Mountain, Fuller L and Highland Valley.
1981	No evidence of budworm found.

Western oak looper, Lambdina somniaria

This solitary defoliating looper is common within the range of Garry oak on southern Vancouver Island. It is occasionally found on grand fir, red alder, vine and broadleaf maple, Douglas-fir and willow when associated with the Garry oak. Frequently abundant in localized areas; periodic infestations in the Victoria area: 1946-50, 1958-61. Defoliation has caused mortality of Douglas-fir interspersed in stands of Garry oak.

Year	Remarks
1946	Localized infestations in Lakehill and Cedar Hill areas of Victoria. Found up to 1200 eggs per ft^2 of tree trunk surface.
1947	Several hundred acres of oak 75-100% defoliated in vicinity of Victoria. Up to 200 larvae per beating.
1948	Increase; scattered areas of oak 100% defoliated. Some mortality of D where interspersed with oak. Most severe defoliation in the Mt. Douglas, Lakehill and Uplands districts.
1949	Increase in Greater Victoria, severe defoliation former infestations coalesced. Alder, maple, Douglas-fir and willow associated with oak also defoliated. 53% egg parasitism in Uplands area.
1950	Infestations subsided; high larval parasitism recorded.
1951	Decrease, only slight defoliation near Victoria.
1952	Decrease, small stand of oak lightly defoliated in Victoria.
1953	One small spot infestation in Victoria.
1954-57	Not mentioned in reports; presumably at low population levels.
1958	Increase, Saanich, 2 ha heavily defoliated; common on Salt Spring I.
1959	Greater Victoria, up to 50% defoliation on Christmas Hill.

Year	Remarks
1960	Greater Victoria, increase continued, defoliation on Christmas Hill.
1961	Greater Victoria, increase, 100% defoliation in scattered areas, some mortality of Douglas-fir and grand fir associated with oak.
1962	Greater Victoria, decrease, light defoliation on Christmas Hill, virus disease prevalent in population.
1963	Infestation subsided.
1964	Low populations.
1965	Greater Victoria, light defoliation, but majority of feeding by a tortricid, Pandemis ribeana.
1966-73	Low populations.
1974-80	Not mentioned in reports.
1981	Severe defoliation of Garry oak and D trees on Saltspring I.

Saddleback looper, Ectropis crepuscularia

The saddleback looper, a native of B.C., is a common defoliator of most conifers in coastal and interior wet belt areas. No significant damage by this pest is known to have occurred on Vancouver Island.

Year	Remarks
1949	Low population.
1950	Common.
1951	Increase, but low numbers.
1952	Increase.
1953	General decline.
1954	No larvae found.
1955-57	Scarce.
1958	Slight increase but low population.
1959	General increase throughout. Largest collection contained 49 larvae at Quatsino Sound.
1960	Low numbers.
1961	Only 4 larvae collected.
1962	Scarce.
1963	No larvae found.
1964-66	Low populations.
1967	Increase, but low population.
1968	Increase, 30 larvae on wH at Victoria L.
1969	Common, higher numbers found in green-striped forest looper infestation areas.
1970	Common.
1971	Scarce.
1972	Scarce.

Year	Remarks
1973	Low populations.
1974-75	Not mentioned in reports.
1976	Increased populations from Tofino to Cape Scott.
1977	Not mentioned.
1978-81	Not mentioned in Vancouver Island report.

Silver-spotted tiger moth, Halisidota argentata

Larvae of this arctiid overwinter within a web, feeding gregariously throughout the winter months. Most of the feeding occurs during the fall and early spring. The preferred host is Douglas-fir, while secondary hosts are: lodgepole pine, western hemlock, western red cedar and grand fir. This insect has been active throughout the south end and east coast of Vancouver Island as far north as Campbell River since 1936. Early damage consists of defoliation of individual branches. Later, top defoliation may occur when maturing larvae disperse. The method used to assess populations was to annually count the number of webs along given stretches of road.

Year	Remarks
1936	Active in Victoria area.
1937	Not mentioned in reports.
1938	Active in Ladysmith area.
1939-46	Not mentioned.
1947-48	Low populations at Sooke.
1949-52	Not mentioned.
1953	Increased population east coast of Vancouver I from Goldstream to Courtenay.
1954	Not mentioned.
1955	Increase in population on east coast, Cowichan L, Gulf Is.
1956	Infestation collapsed.
1957-59	Low population.
1960	Slight rise in population.
1961	Increased to 5 times 1960 population.
1962	Increased to over 5 times 1961 population.
1963	High population on E coast Vancouver I.
1964	Declined from 1963.

Year	Remarks
1965-66	Low population.
1967	Sudden increase throughout usual range. Numerous webs between Parksville and Campbell R.
1968	Population decreased to low level.
1969-71	Low population.
1972	Light defoliation of roadside lP along road to Nanaimo ls.
1973	Light defoliation on scattered trees on southern Vancouver Island.
1974-75	Not mentioned.
1976	A few colonies of larvae in Victoria and Saanich.
1977-81	Not mentioned in Vancouver Island report.

Satin moth, Leucoma salicis

The satin moth, native to Europe and western Asia, was first found in British Columbia at New Westminster in 1920, and on Vancouver Island at Cowichan Bay in 1921. In addition to exotic poplars, trembling aspen, black cottonwood and willow are also attacked. Repeated defoliation may cause some branch or twig-kill.

Year	Remarks
1921	Cowichan Bay, 25 silver poplars defoliated.
1922	Defoliation of Lombardy, silver and other species of poplars occurred at Duncan, Nanaimo and Qualicum.
1923	Incipient stages of an outbreak noted in Victoria.
1924-32	Distribution extended as far north as Campbell R, causing up to 100% defoliation of bCo and W.
1933-36	Not mentioned in reports, presumably scarce.
1937-39	Victoria, sporadic defoliation of Lombardy poplars and aspen in surrounding areas.
1940-46	Not mentioned in reports.
1947	Nanaimo and Courtenay, up to 75% defoliation of silver poplars.
1948	Nanaimo, small infestation on silver poplars.
1949-53	Not mentioned in reports.
1954	Victoria, a few silver poplars defoliated.
1955	Silver and Lombardy poplars defoliated in Comox and Courtenay areas, small infestations at Nanaimo and Victoria.
1956	Metchosin to Courtenay, defoliation of Lombardy and silver poplars.
1957	Victoria to Nanaimo, 100% defoliation in scattered areas, some tree mortality and branch killing of Lombardy poplars. Infestation at Courtenay subsided.

Year	Remarks
1958	Infestations subsided.
1959	Victoria, small spot infestation.
1960	Scarce.
1961-64	Victoria and Courtenay - Comox areas, spot infestations on silver Lombardy poplars.
1965	Small infestations in Saanich and Langford, infestations in Courtenay area subsided.
1966-68	Scarce.
1969	Up to 80% defoliation of silver poplars in Lewis Park, Courtenay. Larvae severely parasitized.
1970-71	No larvae found.
1972-74	Scarce.
1975	Light to moderate defoliation of tA and bCo at two locations in Victoria and one in Nanaimo.
1976	100% defoliation of some tA trees in Nanaimo and Victoria.
1977-81	Not mentioned.

Tent caterpillars, Malacosoma californicum pluviale and M. disstria

These colonial defoliators of alder and willow also feed on a variety of other deciduous trees and shrubs. Damage usually causes the loss of some wood growth or fruit crop but seldom causes mortality. These species are commonly found throughout the Gulf Islands, Saanich Peninsula, Duncan, Nanaimo, Parksville areas, and around Courtenay and the Comox Peninsula. Although they are separate species, they are often associated within the same general areas.

Year	Remarks
1936	Infestation in Victoria area.
1937	Decline in infestation around Victoria.
1938-44	Low population.
1945	Sooke, severe infestation on red alder.
1946-54	No mention in reports.
1955	High populations at Nanaimo, Nitinat Lake and Saanich Peninsula.
1956	Severe defoliation of red alder and willow at Union Bay and Campbell R.
1957	No record in report.
1958	Drop in population on Saanich Peninsula.
1959-60	No record in report.
1961	Qualicum to Campbell R and Port Alberni, increase.
1962	Port Alberni, increase. Some Polyhedrosis virus on North Vancouver I.
1963	Duncan and Saanich Peninsula (both spp.) scattered in North.
1964	Duncan and Saanich Peninsula, severe defoliation, egg masses scarce in fall.
1965	Reduced population, occurring on orchard trees.
1966-67	Low population throughout.

Year	Remarks
1968	Rising populations on Saanich Peninsula, Gulf Is and Courtenay.
1969	High populations on Gulf Is, Saanich Peninsula, Comox, Denman and Hornby Is and around Parksville.
1970	Same areas as in 1969, but loss of vigour due to Polyhedrosis virus.
1971-73	A few tents observed on Gulf Is, Saanich Peninsula and Denman and Hornby Is.
1974	Severe defoliation in localized areas on Gulf Islands, in Victoria and Saanich.
1975	Moderate to severe defoliation of deciduous hosts in Victoria area, on Gulf Is, along east coast of Vancouver I, and in Port Alice area.
1976	Widespread defoliation of deciduous hosts on Vancouver I from Sooke to Ladysmith and on southern Gulf Is; localized pockets of 100% defoliation.
1977	M. disstria not found and M. pluviale not mentioned in reports.
1978-81	Neither insect mentioned in reports.

Fall webworm, Hyphantria cunea

A widespread colonial defoliator of deciduous trees in southern British Columbia, of which alder, cottonwood, birch and willow are the most important forest hosts. Entire trees may occasionally be defoliated. The unsightly damage characterized by skeletonized, shrivelled brown leaves encased in webbing, is most conspicuous late in summer.

Year	Remarks
1959	Moderate defoliation of rAl and W from Parksville - Campbell R.
1960	Severe defoliation of rAl and W from Parksville - Campbell R.
1961-	Defoliation of rAl and W from Malahat to Campbell R, most severe at Ladysmith on rAl.
1962-69	Low populations.
1970	Increased on rAl from Duncan to Nanaimo and in lower Fraser River Valley on black cottonwood shelterbelts. Up to 80% defoliation on fringes.
1971	Low numbers, Duncan - Nanaimo and Victoria - Sooke.
1972-73	Scarce.
1974-77	Not mentioned in reports.
1978	Low populations near Ladysmith, Nanoose, Sproat L and on Galiano I.
1979	Not mentioned in report.
1980	High populations near Ladysmith and scattered locations from Duncan to Menzies Bay, along Cowichan L Rd. and in Comox area.
1981	Not mentioned in Vancouver I report.

Striped alder sawfly, Hemichroa crocea

This species was introduced into British Columbia between 1920 and 1925. The larvae feed on alders in colonies and skeletonize entire leaves. There may be two generations per year in coastal areas which often results in near complete defoliation of trees for the greater portion of summer months. This sawfly is suspected of causing low mortality of alders.

Year	Remarks
1948	Victoria, 100% defoliation of red alder.
1949	Saltspring I, Duncan Bay to Menzies Bay, up to 100% defoliation of red alder.
1950	Alberni, Saltspring I, Campbell R - Duncan Bay.
1951	Decline of infestation except at Beaver Point on Saltspring I.
1952-54	Occasional light areas of infestation near Oyster R and Saltspring I.
1955-73	Very scarce.
1974-75	Not mentioned.
1976	Severe defoliation on southern Saltspring I.
1977	Severe defoliation in localized areas from Mill Bay to Nanoose on Vancouver I and also on Saltspring and Gabriola Is.
1978	Infestations continued in same areas.
1979-81	Not mentioned.

Conifer sawflies, Neodiprion spp.

Larvae of Neodiprion spp. attack most conifers, particularly western hemlock, amabilis fir and lodgepole pine.

Year	Remarks
1940	Active at Cottonwood Cr. Negligible defoliation of amabilis fir, western hemlock and mountain hemlock.
1941-47	Low populations.
1948	Infestation in Victoria L area. No defoliation.
1949	Infestation continued.
1950	Decline in population at Victoria L.
1951	Decline in population throughout Vancouver I.
1952	Activity in spot areas from Salmon R to Great Central L.
1953-56	Low population throughout Vancouver I.
1957	Increased populations following blackheaded budworm infestations in Quatsino - Port Hardy area.
1958	Decline in population.
1959-62	Low population.
1963	Severe defoliation of lodgepole pine at Campbell R over 3 km^2.
1964	Slight decline; no apparent defoliation.
1965-70	Low fluctuating population.
1971	35% of collections positive, averaging 5 larvae each.
1972	Low populations.
1973	Light defoliation along Memekay R, at Labour Day L, and Pretty Girl Cove.

Year	Remarks
1974	Not mentioned.
1975	Severe defoliation of wH on 2 ha at Coquois Cr on west side of Naroutsos Is.
1976	Not mentioned.
1977	Low populations.
1978	Severe defoliation of wH and aF, on northern Vancouver I at Schoen Cr, Kelsey Bay and Cormorant and Pearse Is. High larval populations at Schoen L, Haihte L, Holberg, Port Alice, Rheinhart L and Green Mtn.
1979	High populations at Keta and Haihte lakes, Big Tree Cr and Kelsey Bay areas.
1980	High populations in above areas but cool wet weather hampered larval development; no current defoliation recorded.
1981	wH and aF severely defoliated over 4 400 ha in Kelsey Bay area; lighter defoliation west to Adam River.

Pine butterfly, Neophasia menapia

The pine butterfly is a serious killer of ponderosa pine in the northwestern United States. On Vancouver Island where Douglas-fir is the host, large flights of butterflies were reported during 1896, 1943, 1944, 1949 and every year from 1957 to 1966. In 1959 an outbreak occurred in Cathedral Grove (MacMillan Park) and continued until 1961, when approximately 600 ha of infested Douglas-fir trees were sprayed to prevent spread of the infestation. No tree mortality attributable to pine butterfly has occurred on the Coast, but some pondeross pine have been killed in the Okanagan. Detection of larvae is difficult since they feed in the upper crowns of mature trees so that most quantitative observations have been on the adult stage.

Year	Remarks
1934	Large butterfly flight reported near Campbell R.
1935-36	Not mentioned in reports.
1937	Butterfly flights reports at Nanaimo and Nimpkish rivers, no defoliation observed.
1938	Butterfly flight observed at Tugwell Cr.
1939	Not mentioned in reports.
1940	Numerous adults reported at Cowichan L.
1941-42	Not mentioned in reports.
1943	No reports of outbreaks, but adults were seen at many points on Vancouver I.
1944	High populations of adults were reported on central Vancouver I near Buttle L and between Parksville and Campbell R.
1945-48	Not mentioned in reports.
1949	Large flights of adults observed near Woss L.
1950	Woss L, numerous butterflies, no defoliation.
1951-56	No butterfly flights reported.

Year	Remarks
1957	Mass flights observed at MacMillan Park, Elk R and Drum ls.
1958-1959	Numerous adults at Neroutsos L, Nimpkish L, Gold R and MacMillan Park.
1960	Infestation in Douglas-fir at MacMillan Park, 20% defoliation. High populations also in Cameron R Valley, Dunsmuir Cr Nanaimo ls.
1961	Populations decreased, 600 ha in lower Cameron R Valley sprayed to prevent further defoliation and spread of infestation.
1962	Infestations collapsed, small number of adults observed at Forest Research Laboratory site.
1963	Infestation in Nimpkish R Valley, 25% defoliation near Woss Camp. High egg mortality.
1964	Populations declined. Small flights reported in Copper Canyon and Nanaimo R.
1965	Increase, high population in Nimpkish R Valley causing light defoliation.
1966	Numerous adults in the Chemainus and Nanaimo rs drainages, but little defoliation. Populations elsewhere decreased.
1967	Decrease, small flight reported along Chemainus R.
1968	Adult flights observed at MacMillan Park and McKay Cr, no damage.
1969-70	No butterfly flights observed.
1971	Increase, adults common between Cowichan L and Nanaimo Lakes.
1972	Numerous flights on S. Vancouver I.
1973	Moth flight reported in the Nimpkish Valley. No defoliation.
1974	High numbers of adults in Neroutsos Inlet area.
1975	Not mentioned.

Year	Remarks
1976	Low numbers of larvae on 25 exotic pine trees in Victoria.
1977	Not mentioned.
1978	Adults common in Victoria and Gulf Islands area and from Alberni to Parksville.
1979-81	Not mentioned.

Antique tussock moth, Orgyia antiqua badia

Although this liparid has caused obvious defoliation of branch tips of western hemlock, populations have never been high enough to cause severe defoliation. It is known to feed on several species of deciduous trees and shrubs as well as Sitka spruce, Douglas-fir and western hemlock. Population increases have occurred in the past in coastal areas, in association with other defoliators.

Year	Remarks
1930	Large numbers in Cumberland area.
1931-43	No mention in reports.
1944-45	Large flights of moths seen in the Victoria area. There were large numbers of larvae in the summer and egg masses in the fall on western hemlock in areas south of Cowichan L and in the Quatsino region.
1946-56	No mention in reports.
1957	Low population at Holberg Inlet on hemlock, cedar and spruce.
1958	Light population at Holberg Inlet, Rupert Inlet and Drake I.
1959-60	Low population on Drake I.
1961	Population on Drake I collapsed.
1962-66	Low population.
1967	Low population. Average of 4.3 larvae in 12 positive samples in northern half of Vancouver I.
1968	Low population. Average 1.4 larvae in 9 positive samples in northern half of Vancouver I.
1969-71	Low population.
1972	Light defoliation of several trees at Gorge Vale Golf Course.
1973	Low populations. None found at golf course.

Year	Remarks
1974-1980	Not mentioned.
1981	Light defoliation of D in two seed orchards in Saanich. Adults of antique and Douglas-fir tussock moths trapped, also in shadehouses at PFRC on Burnside Rd.

SUCKING INSECTS

Spruce aphid, Elatobium abietinum

Sitka spruce growing close to the sea and in low lying areas are important as windbreaks and also act to counter erosion. Although spruce aphid has often caused up to 100% defoliation, few trees are actually killed and recovery is generally good.

Year	Remarks
1940	Severe defoliation in Victoria area on sS, Norway and blue spruce.
1941-57	Not mentioned in reports.
1958	Up to 100% defoliation throughout host range on south and east coasts of Island.
1959	Infestation collapsed.
1960	10-30% defoliation at Sooke.
1961-67	No mention in reports.
1968	10-50% defoliation at Sooke and Jordan R.
1969	Very light population, no damage recorded.
1970	Severe defoliation, Victoria to Jordan R, Qualicum R mouth.
1971	Infestation collapsed.
1972-73	None found.
1974-80	Not mentioned
1981	Defoliation severe in localized areas. 30-100% defoliation of spruce between Victoria and Port Hardy.

Balsam woolly aphid, Aldeges piceae

The presence of this introduced aphid was verified in British Columbia in 1958 and on Vancouver Island in 1959. However, indications are that it had been present on the Mainland since about 1950. Its hosts include most Abies species: amabilis fir, grand fir and alpine. fir.

Year	Remarks
1959	Several large grand firs in Thetis Lake Park found with severe stem attack and one small tree in Beacon Hill Park was severely gouted.
1960	Gout attacks located at three nurseries on the Saanich Peninsula.
1961-63	No increase in localized outbreak at Thetis L Park.
1964	Gouting found at Mt. Douglas and Esquimalt Lagoon. Considerable spread of Thetis L Park infestation.
1965	Aphid found at: Saanich Peninsula; at 28 points S. of Nanaimo; at Gabriola I; and several Victoria nurseries.
1966	Found west of Deerholme and in Valentine Mtn area.
1967-69	Aphids were found at Skutz Falls and Green L near Nanaimo which extended the known area.
1970-71	No change found in infestation boundary.
1972	One infested tree on N. Pender I, where not found previously.
1973-75	No change in infestation boundary on Vancouver I.
1976	Infestation boundary expanded to east of Dunsmuir Cr in Nanaimo River area.
1977	Boundary expanded to Bear Cr Reservoir and Honeymoon Bay.
1978	Special survey conducted; no change recorded in known boundaries.
1979	Not mentioned.

Year	Remarks
1980-81	Not recorded.

TERMINAL BORERS

European pine shoot moth, Rhyacionia buoliana

The European pine shoot moth was discovered attacking ornamental pines in eastern North America in 1914 and was soon distributed over the continent. In British Columbia it is a pest of ornamental pine trees and has not been found in natural growing stands of hard pines. This insect attacks terminals and laterals of pines, sometimes killing them; height-growth is reduced and tree form can be affected. Most two and three needle pines (hard pine group) such as red, Scots, Austrian, Mugho, lodgepole and ponderosa pines, are susceptible to attack. Intensive surveys for this pest on Vancouver Island were made from 1963 to 1965.

Year	Remarks
Up to 1960	No mention in reports.
1961	One pupa found at Victoria.
1962	No mention in reports.
1963	Seven specimens found mostly in nurseries on South Vancouver I.
1964	Eleven specimens found on South Vancouver I.
1965	Twenty-seven specimens found on South Vancouver I. Three specimens found at Sidney, Wellington and Victoria, all on nursery and ornamental stock.
1966	No mention in reports.
1967-68	Not found in natural stands.
1969-70	Scarce.
1971	A few larvae found at Lohbrunner's Nursery. Not found in natural stands.
1972-73	None found.
1974-75	Not mentioned in Island report.
1976	No damage recorded. Soolure flight traps in Victoria caught no adults.

Year	Remarks
1977	Not mentioned.
1978	Light damage occurred on ornamental pines on southern Vancouver I; low to moderate numbers of male moths in flight traps in Victoria area.
1979	Continued damage of ornamental pines on southern Vancouver I. Adults caught in flight traps in Victoria.
1980-81	Not mentioned.

LEAF BEETLES

Pacific willow leaf beetle, Pyrrhalta carbo

Common skeletonizers of alder, willow and poplar leaves, often resulting in severe defoliation over large area. No tree mortality has been recorded. Both Pyrrhalta carbo and P. punctipennis have a wide distribution in British Columbia.

Year	Remarks
1936	Extensive outbreak on willow on southeast Vancouver I.
1948	Severe defoliation of willow in the Nanaimo area.
1949-54	No mention in reports.
1955-65	Infestation over large areas from Alberni to Parksville, Nanaimo to Kelsey Bay.
1966-67	Light defoliation throughout approximately the same areas.
1968	Active only at Kelsey Bay.
1969	Menzies Bay - Campbell R low incidence but up to 100% defoliation of some trees.
1970-73	Not found.
1974-75	Not mentioned.
1976	Not found.
1977-81	Not mentioned.

NEEDLE MINERS

Hemlock needle Miner, Epinotia tsugana

This insect, previously unknown to the Survey, caused sudden, spectacular defoliation of western hemlock on northern Vancouver Island at Ida Lake in 1963 and again from 1965 to 1967 in the Holberg and Mahatta River areas. Its life cycle allowed it to feed actively throughout the winter months, and damage was visible in early spring. There has been no recurrence of an outbreak since 1967; in fact, no larvae have been found since that time!

Year	Area affected	Remarks
1963	42 km^2	Ida L and Reed L - severe defoliation on lower foliage and light on mid and upper thirds of crowns.
1964		Activity at Ida and Reed ls ceased; normal complement of foliage. Cast needles examined - 36% showing insect feeding punctures.
1965	406 km^2	Severe defoliation at Holberg and Mahatta R. Discoloration found in May at Holberg, specimens collected, identified to genus by Freeman.
1966	192 km^2	Decline in Holberg area, increase in Mahatta R - Buck Cr area. Much reduced egg population in August.
1967	-	Marked decrease in population and damage.
1968	Trees recovering, no further damage.	Infestation subsided, no sign of insect.
1969-73		No evidence of insect.
1974-81		Not mentioned.

BARK BEETLES

Douglas-fir beetle, Dendroctonus pseudotsugae

Normally this bark beetle is not as important a pest of Douglas-fir on the Coast as it is in the Interior. However, serious outbreaks have occurred in the past two decades in mature and overmature Douglas-fir stands. Some infestations followed predisposition of the host by drought or fire; others were caused by population build-ups in recent windfall, and felled logs left in the woods through winter and summer.

Year	Remarks
1914	Reported killing Douglas-fir at Cowichan L and at Seymour Narrows near Campbell R.
1938	Groups of trees killed adjacent to recent logging at upper end of Comox L.
1939-40	Infestation continued in Comox L area at Cruikshank R and near headwaters of Chemainus R valley.
1941	Decrease in populations.
1942-47	No mention in reports.
1948	Wilson Cr (in Caycuse R valley), trees predisposed to attack by hemlock looper defoliation.
1949	Wilson Cr infestation continued.
1950-52	No other outbreaks found.
1953	Victoria and North Pender I: light attacks on a few trees on dry sites probably predisposed by drought. Gordon R - light attacks, population increased in blow-down the previous two years. Van West Logging near Cumberland - standing Douglas-fir attacked adjacent to felled and bucked trees left over a twelve month period.
1954	Van West Logging near Cumberland - no new attacks. Nimpkish R Valley - severe infestation in mature Douglas-fir, outbreak started in windfall. Buttle L - clusters of dead Douglas-firs at higher levels, probably predisposed by drought.

Year	Remarks
1955	Nimpkish Rvalley approximately 40,000,000 board feet killed, salvage in progress, infestation subsided. At Campbell R - Buttle L area, a few groups of newly attacked trees were visible. Van West Logging, salvage in progress.
1956	Final loss figure in Nimpkish R valley 66,000,000 board feet. Van West Logging, sporadic beetle activity.
1957-73	Low populations with attacks confined to slash and felled and bucked logs.
1974	Attacked tres found in MacMillan Park, on East Saanich Indian REserve, at Stocking Cr near Chemainus, at Coombs, Oyster and Heber rivers and north of Ralph Cr and Buttle L. High beetle populations in windfelled trees in Cameron-Alberni region.
1975	Moderate to high populations in a few blowdown D trees at Cathedral Grove.
1976	Scattered trees attacked throughout host range on Vancouver I.
1977-80	No occurrence on Vancouver I.
1981	10 recently killed D trees recorded west of Shawnigan L at Wild Deer L.

Mountain pine beetle, Dendroctonus ponderosa

The main host on Vancouver Island is western white pine. Most of the white pine stands have been gradually depleted by the mountain pine beetle in the last three decades. The initial buildups of the beetle populations were probably in the many dying pines infested by white pine blister rust in the early 1930's. Beetles attacked and killed large and small white pine trees from the mid-1940's through the 1950's and 1960's[1/]. By 1966, 85% of the pines south of Port Alberni were killed.

Year	Remarks
1950-54	Increasing numbers of red-topped pines evident on Vancouver I, especially in the southern portion.
1955	Groups of from 4 to 30 red-topped trees at Copper Canyon, Cameron L, Corrigan Cr, Lois L and Eagle Heights.
1956-59	Dead white pines common throughout Island. Numerous in Sooke watershed; some smaller pines which were infected with blister rust were also infested with beetles.
1960-62	Groups of dead pines south of Cowichan L, around Great Central L, in the Oyster R valley, Buttle L and Renfrew Rd. (The majority of beetle kill occurred prior to 1960 although green attacked trees were still found).
1963-65	Active in Nimpkish R valley, Muchalat L, Buttle L, Forbidden Plateau, S. side Muchalat Inlet and Beaufort Range, average 66% of wP killed.
1966	Majority of white pine killed; infestation expected to continue but must soon decline due to scarcity of host material. Estimated loss: 144,000,000 cu ft over 135 300 ha.
1967-73	No further incidence of beetle attacks.
1974-75	Not recorded on Vancouver I.

1/ Collis, D.G., N.E. Alexander. Mountain pine beetle damage to western white pine on Vancouver Island, INF. REP. BC-X-9, Oct. 1966, 5 p.

Year	Remarks
1976	25 wwP killed near Weeks L and a few more were attacked near Rheinhart L.
1977-80	No occurrence on Vancouver I.
1981	Total of 240 wwP and 1P trees recorded on 50 ha at Adrian Cr on Vancouver I.

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