

PROVINCE OF BRITISH COLUMBIA

FOREST INSECT SURVEY

G. T. SILVER AND D. A. ROSS

Forest Biology Laboratory, Victoria and Vernon, B.C.

INTRODUCTION

The field season of 1959 was characterized by some interesting changes in the status of several chronic insect pests. The black-headed budworm, which was at a low population level following the collapse of the outbreak on Vancouver Island in 1957, increased to major infestation proportions in the Queen Charlotte Islands. Numbers of larvae collected per sample were larger than obtained previously, and some hemlock stands which have not recovered from the previous outbreak are already in critical danger. Black-headed budworm numbers also increased along the northern mainland coast.

The spruce budworm infestation in the Lillooet and Fraser River valleys collapsed after an outbreak period of six years. In the Babine Lake area the two-year-cycle spruce budworm infestation continued unabated. Very large larval populations were present and barring any unforeseen mortality, defoliation is expected to be heavy in 1960. Farther north a small one-year-cycle spruce budworm infestation in the Liard River Valley caused up to 98 per cent defoliation of the current year's growth.

The balsam woolly aphid, whose presence in British Columbia was verified in 1958, has killed over 3,900 amabilis fir, ranging up to 50 inches D. B. H., and many more trees are under heavy attack.

Several species of loopers increased in abundance or remained at relatively high levels. About 550 acres of Stanley Park, Vancouver, were sprayed to protect the aesthetically valuable mature and overmature western hemlock.

No major infestations developed in the Interior. Population levels of defoliators generally were reduced. One of the most noticeable occurrences, although of little economic importance, was the presence of numerous patches of *Ips*-killed red-topped ponderosa pine trees.

The insect collections submitted by the British Columbia Forest Service personnel and by other co-operators are gratefully acknowledged. Sincere thanks also go to members of the British Columbia Loggers' Association and the provincial Forest Service for their assistance in the use of aircraft, vehicles, men, and accommodation.

The Victoria Laboratory received 2,733 insect collections and the Vernon sub-laboratory 3,061 for a total of 5,794. This was an increase of 657 compared with 1958. Collections received during 1959 were distributed among the principal tree species as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Hemlock		Poplar	
Western hemlock.....	997	Trembling aspen.....	165
Mountain hemlock.....	26	Black cottonwood.....	93
	<hr/>	Silver poplar.....	11
	1,023	Balsam poplar.....	4
Douglas fir.....	949	Lombardy poplar.....	3
		Miscellaneous poplars.....	6
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Coniferous Trees		Collections	Broad-leaved Trees		Collections
Spruce			Alder		
White spruce.....	403		Red alder.....	89	
Engelmann spruce.....	204		Sitka alder.....	31	
Sitka spruce.....	119		Mountain alder.....	29	
Black spruce.....	71		Green alder.....	2	
Miscellaneous spruces.....	3		Miscellaneous alders.....	41	
		800			192
Pine			Birch		
Lodgepole pine.....	459		White birch.....	33	
Ponderosa pine.....	227		Dwarf birch.....	19	
Western white pine.....	82		Water birch.....	11	
Miscellaneous pines.....	4		Western white birch.....	5	
		772	Miscellaneous birches.....	45	
Fir					113
Alpine fir.....	260		Willow.....	245	
Amabilis fir.....	88		Garry oak.....	52	
Grand fir.....	55		Cherry.....	45	
Balsam fir.....	3		Maple.....	16	
		406	Broadleaf maple.....	14	
Western red cedar.....		161	Dogwood.....	10	
Larch			Apple.....	9	
Western larch.....	83		Arbutus.....	5	
Tamarack.....	35		Hazelnut.....	5	
European larch.....	2		Miscellaneous broad-leaved trees.....	194	
Miscellaneous larch.....	5				
		125			
Juniper			Total.....	1,182	
Rocky mountain juniper.....	44				
Common juniper.....	17				
Miscellaneous juniper.....	1				
		62			
Miscellaneous coniferous trees...		5			
		4,303			
Total.....					
Miscellaneous hosts or no hosts specified.....		309			
Grand Total.....		5,794			

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The one-year-cycle spruce budworm infestation in the Lillooet and Fraser River areas has collapsed after causing heavy defoliation to Douglas fir trees since 1954. An aerial survey on July 29 failed to detect any signs of defoliation.

A trace of defoliation was observed on new foliage in one area along Seton Lake and at Skookumchuck and Rogers Creek in the Lillooet River and Lake region. Tree recovery appeared to be good; tops which were completely stripped of all foliage put out buds and green shoots in 1959. In localities where defoliation has been light for two or three years, foliage appears to be almost back to normal. Very few larvae were found during the feeding period, and only five egg masses were found in 1959, two at Tisdall, and three at a Tenas Lake plot. Egg mass counts along the Lillooet River averaged only 1.7 per 100 square feet of foliage compared with 26 for 1958. No egg masses were found along Anderson and Seton lakes or in the Fraser River Valley.

Elsewhere in the Vancouver District larvae were collected in small numbers at scattered localities.

Farther north, along the Alaska Highway between mileages 490 and 540, the one-year-cycle budworm was common and at a few points damaged from 50 to 98 per cent of the current year's buds of white spruce. The largest numbers were in the Liard River Valley. In one instance larch trees were severely defoliated over an area ½ by 1½ miles.

The two-year-cycle spruce budworm outbreak in the Babine Lake region of the Prince Rupert Forest District continued unabated in 1959. Early counts indicated the larval population was as heavy as any recorded to date. In 11 white spruce plots sampled, 86.2 per cent of the buds examined were infested, and in 15 alpine fir plots 82.1 per cent of the buds were infested. Damage at this stage was light, probably as a result of the cool, damp spring which apparently slowed the feeding rate considerably. This also enabled the trees to produce more foliage than in the past few years. A re-examination in late July and early August disclosed that heavy feeding had occurred. The heaviest damage was at the Smithers Landing-Mine Road Junction where all the 1959 foliage was lost, and, of 633 buds examined, 511 were killed and the remainder completely defoliated. Current defoliation of other stands along Babine Lake was estimated at 75 per cent with the percentage of buds killed ranging from about 9 to 40 per cent.

As this was the first, and light-feeding year of the two-year-cycle form, no estimate of the outbreak area was obtained, but there was no indication of any reduction in the infestation. Barring any unforeseen mortality, heavy defoliation can be expected in 1960. Although most stands are in fair condition, continued defoliation could have serious consequences as occasional heavily defoliated trees have already died.

Larvae were also abundant at sample plots on Pinkut Lake, Taltapin Lake, and west of Walcott Station. Larvae were collected in small numbers throughout most of the remainder of the East Prince Rupert District.

There was a small increase over 1957 in the population level of the two-year-cycle budworm in spruce and alpine fir in the southern portion of Prince George Forest District. Sampling indicated that moderately heavy populations were present, among other points, at Genevieve Lake, Willow River, Strathnaver, Manson Creek Road, Takla Lake, Trembleur Lake, Tudyah Lake, and Silver Sands Creek. Most two-year-cycle budworm larvae do not develop beyond the fourth instar in odd-numbered years such as 1959. Collections: Coast 108, Interior 125.

Black-headed Budworm, *Acleris variana* (Fern.)—The black-headed budworm outbreaks on the Queen Charlotte Islands increased to heavy proportions in 1959. Collections of 600 larvae per three-tree beating sample were common from Skidegate Inlet south to Jedway on Moresby Island, and along the north side of Skidegate Channel on Graham Island. Defoliation was not as heavy as expected in proportion to the larvae present. The heaviest damage was on Moresby Island with medium to heavy damage common from Skidegate Inlet south to Jedway. Western hemlock stands at Copper Creek, near Aero Camp on Gillatt Arm, Lagoon Inlet, Newcombe Inlet, and Barrier Bay in Tasu Sound have not recovered from the previous black-headed budworm outbreak which subsided in 1955. This old damage is still evident in the dead tops, present in the stands. As many as 60 per cent of the trees are now totally defoliated.

An egg and tree damage survey was conducted in October, 1959 with the financial support of the B. C. Loggers' Association which supplied aircraft, ground transportation, accommodation, and fallers. A total of 82 points were sampled. The egg count for each sample point was the average number of eggs per 10-inch branch tip based on five tips from the upper crown level of each of three trees. Medium numbers of eggs were found at only two points on Graham

Island, at Tow Hill and Awun Lake. The heaviest egg counts were between Skidegate Inlet and Cumshewa Inlet where the number of eggs ranged to 76.7 at South Bay. This was also the area of heaviest budworm damage in the last outbreak.

Eight points sampled in 1958 averaged 7.2 eggs. The same points sampled in 1959 averaged 18.3 eggs, more than a two-fold increase. The small number of samples in 1958 makes it difficult to state that the increase is actually two-fold but the number of eggs in 1959 is significantly greater than in 1958.

Parasitism was very light. Less than one per cent of the larvae collected from Graham Island and reared were parasitized. Parasitism was higher on Moresby Island, averaging five per cent, but the majority of the parasites were obtained from only four collections in which parasitism varied from 12 to 24 per cent. No evidence of virus disease was found.

High hazard stands, which are considered in immediate danger of heavy defoliation, top-kill, and possibly some tree mortality total about 30,000 acres. These stands are all in the Skidegate Inlet-Cumshewa Inlet area and are as follows: South Bay to Alliford Bay, Copper Creek, and at the head of Gillatt Arm. An aerial spray program is proposed for June, 1960.

Increases in the black-headed budworm population level also occurred along the mainland coast from Bella Coola to Portland Canal. Three-tree beating samples on Princess Royal Island averaged 12 larvae, with a maximum of 45. An increase occurred in the Portland Canal-Observatory Inlet area where up to 49 larvae and 13 pupae were collected in individual samples.

On northern Vancouver Island black-headed budworm numbers remained at a very low level in 1959. Larvae were collected in small numbers, and egg counts made at 28 sample points averaged 0.042 eggs per 10-inch tip compared to 0.024 eggs per sample in 1958.

In the Interior the black-headed budworm declined to a very low level in 1959. Collections: Coast 256, Interior 78.

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The known range of the balsam woolly aphid in British Columbia was increased in 1959. Groups of heavily attacked amabilis fir were observed on the west side of Howe Sound at Dakota Creek, Rainy River, and Potlatch Creek. The insect was also found attacking grand fir at Thetis Lake Park and in Beacon Hill Park, Victoria.

The balsam woolly aphid attack on the mainland has resulted in heavy tree mortality. During a two-hour aerial survey 3,900 dead and dying trees were recorded in the Howe Sound, West and North Vancouver areas. The heaviest mortality occurred in Cypress Creek where an estimated 2,000 dead amabilis fir were visible from the air. Ground plots and strip cruises showed that the dead trees were generally mature and overmature, and ranged from 10 to 50 inches D. B. H. In addition to the trees counted in the aerial survey, considerable numbers of green amabilis fir of all diameters are suffering from gout attack with occasional trees showing stem attack. Tree mortality can be expected to continue.

During examination of infested trees in plots on Grouse and Seymour mountains in North Vancouver it was noted that many amabilis fir in the area were attacked by a bark beetle which has been identified as *Pseudohylesinus* sp. Close examination showed that attacks in all green trees consisted of nothing more than a penetration of the bark into the cambium or to the wood surface. In three cases where the foliage was red, successful bark beetle galleries were found. The death of these trees was apparently caused by the balsam woolly aphid with the bark beetle attacks being strictly of a secondary nature.

Periodic observations carried out during the summer and fall resulted in a number of predacious mites and syrphids being recorded as attacking the balsam woolly aphid but no predators capable of exerting any marked degree of control were found.

Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopk.—In the Cariboo region, Douglas-fir beetle populations persisted at about the 1958 levels; elsewhere there was an apparent decline. In some localities the summer flight was greater than the spring flight.

In the coastal region no living trees were found to be attacked. Heavy beetle concentrations were found in felled and bucked timber at Pine River near Pemberton and in the Van West Logging operations near Comox.

Mountain Pine Beetle, *Dendroctonus monticolae* Hopk.—The mountain pine beetle continued to kill white, ponderosa, and lodgepole pine at about the same rate as in 1958. Particularly noteworthy current infestations were as follows: in white pine—Trinity Valley and Mabel Lake, Kamloops Forest District; Silverton Creek and Upper Arrow Lake, Nelson Forest District; in ponderosa pine—Long Lake and Alleyne Lake, Kamloops Forest District; in lodgepole pine—along Lussier River near the junction of Coyote Creek, and along Elk Creek at the junction of White River, Nelson Forest District. A heretofore unrecorded infestation was discovered along a new roadway in the Kettle River Valley between Damfino and Winnifred creeks. Aerial reconnaissance showed that over 1,000 lodgepole pines, have been killed during the past five years.

The severe mountain pine beetle outbreak in lodgepole pine along the east shore of Babine Lake in the Prince Rupert District continued to decline. Only scattered red tops were observed.

Engelmann-spruce Beetle, *Dendroctonus engelmanni* Hopk.—The Engelmann-spruce beetle persisted at a low population level in the Nelson Forest District. Spruce trees containing 100,000 fbm were killed in 1958 at Forster Creek. No new beetle attacks were observed at Bighorn or Grave creeks. Logging of infested trees on other localities further reduced beetle numbers.

In the Kamloops Forest District there were light attacks in Engelmann spruce at Vavenby, Sock Lake, and on White Rock Mountain.

A Spruce Beetle, *Dendroctonus* sp.—Tree mortality continued in a localized beetle outbreak four miles southwest of Smithers in the Prince Rupert District. Mortality now totals 33,800 cubic feet, an increase of 12,800 cubic feet over 1958. Logging operations now in progress are expected to salvage most of the timber.

White spruce stands on six timber sales from Cedarvale to Kitwanga Lake in the Prince Rupert District have suffered heavy mortality from spruce bark beetles. The attacks are subsiding; in some areas no green infested trees were observed. Information from the British Columbia Forest Service indicated tree mortality in some localities was as high as 90 per cent of the stands. Both mature and immature spruce are dead or being killed.

Red Turpentine Beetle, *Dendroctonus valens* Lec.—The red turpentine beetle was frequently associated with the *Ips* infestations in ponderosa pine. *Ips oregoni* attacked portions of the crown whereas *D. valens* attacked the basal six feet of the bole.

Western Cedar Bark Beetle, *Phloeosinus punctatus* Lec.—Injury by this bark beetle was very conspicuous in the cedar stands of the Vancouver Forest

District in 1959. Attacks were observed at McLean Creek, Powell River, Lund, on Texada Island, on southern Vancouver Island, Cultus Lake, and Silverdale. At Cultus Lake 78 dead trees and an additional 65 trees with dead tops were counted along 1.7 miles of road. At Silverdale $\frac{1}{4}$ or more of the upper crown of 21 out of 46 trees on a 0.6 acre plot were heavily infested. Attacked trees ranged in size from 5 to 28 inches D. B. H.

Ambrosia Beetles, *Trypodendron lineatum* (Oliv.), and *Gnathotrichus retusus* (Lec.)—These ambrosia beetles continued to be common around soft-wood logging operation on the Coast. *Trypodendron* is by far the more numerous beetle. In 1959 attacks were lighter where susceptible logs were removed from the woods prior to the beetle flight. Losses in Vancouver Island from degraded lumber remained high. At Stanley Park, Vancouver, *Gnathotrichus* beetles were found attacking logs in densities up to 15 per square foot. Ambrosia beetles were active as far north as Terrace where *Trypodendron* attacks averaged 81 per square foot.

Western Balsam Bark Beetle, *Dryocoetes confusus* Sw.—The western balsam bark beetle in association with *Leptographium* continued its persistent insidious attack on alpine fir stands.

During aerial reconnaissance, several large stands of alpine fir, presumably killed by balsam bark beetles and *Leptographium*, were observed near the headwaters of three different waterways: Scotch Creek, Adams River, and West Kettle River. Numerous patches of dead alpine fir were observed along Winnifred Creek and in the upper reaches of Granby River Valley.

Dryocoetes persisted at McGillivray Lake, and Bolean Lake.

The Oregon Pine Engraver, *Ips oregoni* (Eich.)—Numerous small patches of infested ponderosa pine were apparent in the southern Interior in 1959. These were most frequent in the North Okanagan although they were observed at such widely scattered points as Princeton, Grand Forks, Skookumchuck, Elko, and McLure.

Most infestations were in immature pole-sized trees in farm woodlots adjacent to small-scale logging or land-clearing operations, or in windthrown trees. Occasionally *Dendroctonus valens* and *D. brevicornis* were associated with the engraver beetles; in most instances they followed *Ips* attack.

Long-horned Wood Borers in Spruce and Douglas fir, *Monochamus oregonensis* Lec.—In 1958, fires destroyed more timber than usual. Fire-killed spruce and Douglas fir trees were attacked by various wood borers, chiefly *Monochamus oregonensis*, the species that causes greatest devaluation of the wood because it penetrates deepest (average 2 to 4 inches in spruce). In the Prince George Forest District an equal number of samples was taken in the fall of 1959 from spruce trees in each of three classes with bark lightly, moderately, and severely burned in 1958 fires. Samples were taken from burns that occurred at three different times of the year. The average number of *Monochamus oregonensis* tunnels per square foot in these samples is as follows: May 22 burn, 'Lin fire'—1.29; June 6 burn 'Fir fire'—1.24; July 18 burn, Tudyah Lake fire—0.05. The range in the number of tunnels per square foot on these three burns was 0 to 10.5.

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hlst.)—Although no serious infestations developed in 1959, western hemlock looper larvae were common in coastal hemlock stands as far north as the Bella Coola Valley. The largest numbers were found in the South Vancouver District where a maximum of 24 larvae per three-tree beating sample were collected at Seymour River, 19 larvae per sample at Coquitlam Lake, and up to 8 larvae

per sample at Indian Arm, Stave Lake, Pitt Lake, and Maple Ridge Park. The highest numbers were again found in Stanley Park where up to 150 larvae were collected from a single tree. North of Howe Sound collections did not exceed 5 larvae.

On Vancouver Island larvae were common on the western side of the Island from the Nitinat and Cayuse River valleys where up to 7 larvae per sample were collected, to Holberg Inlet, where up to 14 larvae were collected at Wanakana Creek. Smaller numbers of larvae were collected in the Nimpkish River Valley.

As the hemlock looper is generally regarded as one of the most serious defoliators of hemlock, great interest is being focused on the population trend, but in no area has the looper been detected in sufficient numbers to cause undue alarm.

In Stanley Park, larvae were not numerous enough to cause tree mortality ^{but} the aesthetic value of the mature and over-mature hemlock warranted chemical control action to prevent possible top-kill. About 550 acres of the western portion of the Park were sprayed on July 23 with 10 per cent DDT in fuel oil by Skyway Air Services Ltd. An estimated 98 per cent of the hemlock loopers were killed as well as about 90 per cent of the *Melanolophia imitata* Wlk. larvae present.

There was a continued general uptrend in western hemlock looper numbers in the Interior, although they are still low. Collections: Coast 114, Interior 110.

Poplar and Willow Borer, *Sternochetus lapathi* (L.)—This borer was common on Vancouver Island, in the Fraser River Valley, and along Howe Sound. In the Fraser River Valley, attacks were heavy from Mission to Rosedale where 57 to 83 per cent of the willow tallied were infested or dead. Trees ranged from $\frac{1}{2}$ to 4 inches D. B. H. Light attacks on black cottonwood were observed in several areas in the Fraser Valley and a plantation on the University of British Columbia Research Forest at Haney was also infested. Willows at Cowichan Lake and Nanaimo Lakes on Vancouver Island were heavily attacked.

In the Interior, the infestation has spread from Tranquille eastward throughout Brocklehurst and North Kamloops. Only willows have been attacked.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—Very few larvae were collected and no defoliation was observed in the South Vancouver District. In the Prince Rupert District very heavy defoliation occurred near Kitwanga, Telkwa, and the Kispiox River. Aspen and birch trees around Hazelton and on the east side of the Bulkley River were almost completely defoliated. The trees were leafing out again by August. The large number of egg masses present in the fall point to heavy defoliation in 1960 from Kitwanga to about 15 miles east of Moricetown.

In the Interior a new light infestation was observed north of Nicholson. The infestation at McBride remained relatively unchanged. Larvae at Barton Creek, northwest of Adams Lake, were heavily parasitized and the population level declined although the infestation increased to cover some 750 acres. Egg counts in the fall indicated that the McBride infestation will persist but that the Barton Creek infestation has collapsed. Collections: Coast 13, Interior 6.

Western Tent Caterpillar, *Malacosoma pluviale* (Dyar)—The population on the Saanich peninsula remained at about the same low level as in 1958. No defoliation was observed. Only a few colonies were found elsewhere on Vancouver Island and the south-western mainland. The heavy outbreak near Terrace declined in intensity, although tents were still noticeable.

In the Interior the western tent caterpillar was not common in 1959. Only two or three tents of the form that attacks dwarf birch and willow were observed in the Prince George District. Collections: Coast 27, Interior 5.

Green-striped Forest Looper, *Melanolophia imitata* Wlk.—The population level of this looper remained high throughout coastal forests in the Vancouver Forest District. Despite the large number of larvae present defoliation was very light. This is due mostly to their habit of consuming entire needles rather than portions of them. On the mainland larvae were common from Vancouver north to Jervis Inlet. The largest sample, 111 larvae, was collected at Grouse Mountain. The population level decreased in Stanley Park as a result of chemical treatment in 1958. Larvae were present in nearly all samples from Vancouver Island, but were most numerous on the west coast from Tofino to Holberg Inlet where collections of over 100 larvae were common. Light defoliation was observed in Quatsino Sound, and in the Tsitika River Valley. The common host was western hemlock, followed by cedar, Douglas fir, and spruce. Collections: Coast 497, Interior 127.

Silver-spotted Tiger Moth, *Halisidota argentata* Pack.—Webs were more numerous in the spring of 1959 than in 1958 on the eastern portion of Vancouver Island from Victoria to Courtenay, at Cowichan Lake, on the Strait Islands, and on the mainland from Vancouver to Powell River. Although numbers are increasing there was no severe defoliation. Collections: Coast 45.

Pine Butterfly, *Neophasia menapia* Feld.—For the third consecutive year flights of the pine butterfly occurred on Vancouver Island. Adults were observed in the Nitinat River area, Muir Creek, and Englishman River, but the most spectacular flight occurred at Cathedral Grove where thousands of butterflies covered the trees and the road. There was no indication where the flights originated. Only one larva was collected, at Englishman River, during random sampling, and no defoliation was observed in Douglas fir stands in flight areas. Collections: Coast 8, Interior 2.

Sequoia Pitch Moth, *Vespamima sequoiae* (Hy. Edw.)—Ponderosa pine plantations at Green Timbers and Alouette Lake in the Fraser River Valley were heavily infested with this pitch moth. The attacks occur in the top portion of trees up to 8 inches DBH and result in terminal breakage from wind and snow. The pitch moth may be a serious restricting factor to the establishment of ponderosa pine in coastal areas.

Cooley Spruce Gall Aphid, *Adelges cooleyi* (Gill.)—These insects were very abundant on the needles and cones of Douglas fir in 1959. On southern Vancouver Island 100 per cent of the cones were often heavily attacked. In the Fraser River Valley most trees had a medium to heavy population of *Adelges* on current foliage. These insects were abundant on the needles of the alternate host, Douglas fir, in the Kamloops and Nelson forest districts. In eastern portions of Kamloops Forest District a great reduction in new galls on spruce was observed.

Satin Moth, *Stilpnotia salicis* (L.)—Satin moth larvae were numerous in some localities in the Interior but generally defoliation was less severe than in 1958. In some instances this followed extensive spraying in 1958. The known distribution remained unchanged. Recent outbreaks were noted in the following places: 15 miles north of Kamloops in the North Thompson Valley; one mile south of Knutsford, Pritchard, Shuswap, Falkland, and between Wood and Duck lakes.

On the Coast defoliation was confined to a small group of poplar trees in Victoria. Parasitism was relatively light. Collections: Coast 10, Interior 13.

Conifer Sawflies, *Neodiprion* spp.—Larvae of these sawflies were very common in collections from the coastal forests of Vancouver Island and from

the mainland as far north as Rivers Inlet. No defoliation was observed in any area. There were few noteworthy infestations of *Neodiprion* in the Interior during 1959. High population levels persisted on ponderosa pine near Deadman River and on lodepole pine at Squilax. Collections: Coast 472, Interior 453.

Western Winter Moth, *Erannis vancouverensis* Hlst.—Garry oak, maple, and other miscellaneous broad-leaved trees were heavily defoliated in the Cedar Hill and Uplands districts of Victoria. An infestation of this insect, an unusual occurrence in the Interior, was observed at Agate Bay on Adams Lake. Some 10 acres of Douglas maple, birch, alder, and willow were severely defoliated. Collections: Coast 20, Interior 3.

Yellow-lined Forest Looper, *Nyctobia limitaria* Wlk.—This looper increased in numbers in the coastal forests in 1959. The largest numbers were found on the west coast of Vancouver Island where up to 127 larvae were collected in one three-tree beating sample in Quatsino Sound. Hosts included western hemlock, Douglas fir, and spruce. Collections: Coast 191, Interior 83.

Aspen Leaf miner, *Phyllocnistis populiella* Cham.—This miner was again abundant in the Interior. In the Yukon and northern British Columbia numbers increased in some areas and decreased in others. In the western portion of the Kamloops Forest District there was a general decline. Adults were observed in vast numbers from the first week in June until mid August.

The aspen leaf miner was less conspicuous in the Prince Rupert District in 1959. The infestation is now confined to localized spots.

Leaf Miners on Willow and Cottonwood, *Phyllocnistis* sp.—The outbreak of leaf miners on black cottonwood in the Skeena River Valley decreased in intensity.

Fall Webworm, *Hyphantria cunea* (Drury)—Fall webworm numbers increased in the Vancouver Forest District. Alders from Duncan to Courtenay on Vancouver Island were heavily defoliated. The infestation was heavy in the Fraser River Valley and reached its peak at Yarrow where up to 30 webs were counted on individual trees. The outbreak extended north to Powell River.

In the Interior fall webworm numbers decreased except along the Nicola River Valley from Merritt to Spences Bridge where the infestation was moderate. Collections: Coast 17, Interior 10.

Green Velvet Looper, *Epirrita autumnata* (Gn.)—Fewer collections were received in 1959 than in 1958. Larvae were common on Vancouver Island, particularly near Comox, and up to 30 larvae per sample were collected on Whitesail, Eutsuk, and Tetachuck lakes in the Prince Rupert District. The principal hosts were western hemlock and alpine fir. Collections: Coast 102, Interior 39.

Oak Looper, *Lambdina somniaria* Hlst.—Localized outbreaks occurred in the greater Victoria area. Larvae were very numerous in about four acres of Garry oak on Burnside Road, another area of similar size on Quadra Street, and in the Cedar Hill District. Defoliation was moderate. Collections: Coast 12.

Saddle-backed Looper, *Ectropis crepuscularia* Schiff.—The saddle-backed looper was collected in larger than usual numbers throughout western hemlock stands on the west coast of Vancouver Island where up to 41 larvae per sample were collected. Loopers were also common along the mainland coast; a maximum of 72 larvae per sample were collected at Draney Inlet. Collections: Coast 162, Interior 88.

Spruce Aphid, *Neomyzaphis abietina* (Wlkr.).—The heavy outbreak of spruce aphid on Sitka and blue spruce on the southern end of Vancouver Island and in the Fraser River Valley subsided in 1959.

Sitka-spruce Weevil, *Pissodes sitchensis* Hopk.—Over 50 per cent of the young spruce leaders in the Nitinat River and Museum Creek areas of Vancouver Island were attacked in 1959. With few exceptions all the young spruce trees have been attacked at least once in recent years.

Engelmann-spruce Weevil, *Pissodes engelmanni* Hopk.—Again small patches of immature spruce up to 5 and 10 acres in extent were attacked by the Engelmann-spruce weevil at widely scattered points in the central and southern Interior.

A Root-crown Weevil on Douglas fir, *Pissodes* sp.—Numerous open-grown partially red-topped Douglas fir trees, on a dry hillside near Lillooet, supported broods of *Pissodes* sp. about the root collars.

Willow Leaf Beetle, *Galerucella carbo* Lec.—This beetle was responsible for skeletonizing 50 to 80 per cent of the foliage of trembling aspens in the region around Springbrook, Nelson Forest District. It was numerous on willow throughout the District.

From Duncan to Port Alberni on Vancouver Island up to 100 per cent of willow and alder foliage was damaged. Heavy defoliation of willows also occurred on the mainland from Vancouver north to Bute Inlet, and on the Georgia Strait islands.

Flea Beetles, *Altica* spp.—Severe skeletonizing of alder leaves occurred near the Kelowna airport, at McCullough, and in numerous localities in the Nelson Forest District. Beetles were numerous on black cottonwood trees along Kootenay Lake.

Heavy defoliation of alder and poplar also occurred on southern Vancouver Island, particularly around Lake Cowichan.

Douglas-fir Tussock Moth, *Hemerocampa pseudotsugata* McD.—The population level remained very low. The small spot infestation near Lillooet disappeared in 1959.

Douglas-fir Needle Miners, *Contarinia* spp.—Douglas-fir needle miners persisted at low population levels in the southern Interior. Collections: Coast 5, Interior 27.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—In 1959, pine needle scale numbers on ponderosa pine declined between Naramata and Okanagan Falls. An unusually high mortality of nymphs occurred in June.

Light to moderate infestations on ponderosa pine were seen at Summerland, Winfield, Nicola, Savona, and Dufferin Hill.

A heavy population on 10 acres of lodgepole pine was observed in the Bull River area, and at Yahk, Nelson Forest District. Moderate attacks occurred in lodgepole pine near Barriere.

Black Pine-leaf Scale, *Nuculaspis californica* (Coleman)—The black pine-leaf scale outbreak on ponderosa pine persisted at Campbell Mountain and south Penticton although at a lower level than in 1958. The small light infestation in Botanie Valley near Lytton remained unchanged.

Engraver Beetles, *Scolytus* spp.—Engraver beetle attacks were in evidence in the branches of living Douglas fir in the Kamloops Forest District and in larch in the Nelson Forest District.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)—This leaf roller severely defoliated trembling aspen north of Nicholson in the Nelson Forest District. Light to heavy infestations recurred along the Alaska Highway notably at Mile 1205 in Yukon Territory where some 500 acres of aspen were severely defoliated in 1959. Collections: Interior 4.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—There was a slight increase in the abundance of the larch sawfly on eastern larch in the Peace River district. Colonies were rare on western larch in the south. Collections: Interior 8.

Blotch Miners, *Lithocolletis* spp.—This blotch miner of aspen persisted in widely scattered localities but there were no severe infestations. The species attacking black cottonwood declined at Wood Lake, Kamloops Forest District.

Willow Leaf Blotch Miners, *Lyonetia saliciella* Busck—The occurrence of mined willow leaves was widespread in the Nelson Forest District. Miners were also numerous between miles 488 and 624 on the Alaska Highway: the percentage of leaves infested ranged from 0 to 60.

Ugly-nest Caterpillar, *Archips cerasivoranus* (Fitch)—The number of nests declined but they were still fairly numerous on choke cherries near Lytton, Kamloops, and in the Salmon River area, Kamloops Forest District; and at Elko, Ta Ta Creek, and Fairmont, Nelson Forest District. Collections: Interior 13.

Larch Shoot Moth, *Argyresthia laricella* Kft.—A systematic search was made for the larch shoot moth in British Columbia in 1959. Small numbers of infested shoots were collected in the eastern part of the Nelson Forest District along the Findlay Creek Road, Estella Mine Road, and adjacent to Canuck Creek. It was present in almost all larch stands in the western part of the Nelson Forest District. Mined shoots were most common near Midway and Wynndel where about one mined twig per young tree was recorded. There was some evidence of predation, presumably by birds.

Twig-infesting Cecidomyids, Itonididae—Several species including a *Retinodiplosis* were numerous in the 1959 candles and 1958 twigs of ponderosa and lodgepole pines. 'Flagging' and death of the branch terminals usually resulted. Although widespread, the only severe 'flagging' has occurred on ponderosa pine in east Kootenay, near Chase, and in the Okanagan Valley.

Balsam Twig Aphid, *Mindarus abietinus* (Koch)—A heavy infestation of the balsam twig aphid was present on several square miles of immature alpine fir south of McGillivray Lake. The new foliage of the infested trees was moderately discoloured.

Twig Aphid of Grand Fir, *Cinara occidentalis* (David.)—Heavy infestations were observed on grand fir at Creston, Fruitvale, and Big Sheep Creek, Nelson Forest District.

A Douglas-fir Cone Moth, *Barbara colfaxiana* Kft.—There was a heavy crop of Douglas fir cones in 1959, and this moth continued to be the most important pest in the Interior.

The greatest damage occurred in the Okanagan Valley where up to 62 per cent of the cones were infested. In the Nelson Forest District heavy infestations were recorded at Grand Forks, Brilliant, Skookumchuck, and Waldo.

A Cone Borer, *Dioryctria auranticella* (Grt.)—This cone borer persisted as an important pest of ponderosa pine. In general the cone crop was light and the borer infestations were medium to severe in eastern Kamloops and western Nelson forest districts.

Spruce Seedworm, *Laspeyresia youngana* (Kft.)—The heavy white spruce cone crop in Yukon Territory showed 26 to 74 per cent infestation by this seedworm.

Pine Needle Miner, *Zelleria haimbachi* Busck—This insect was numerous on lodgepole pine in the southern part of the Kamloops Forest District and on ponderosa pine in the eastern part of the Nelson Forest District. Greatest numbers, although only in moderate infestations, were at Vaseaux Lake and Wardner.

Pine Tube Moth, *Argyrotaenia pinatubana* (Kft.)—The infestation in lodgepole pine saplings in eastern Nelson Forest District declined.

Pine Shoot Borer, *Eucosma sonomana* Kft.—This pine shoot borer ranges from Elko in the Nelson Forest District to the Okanagan and northward to Chase. In 1959, it was most numerous near Cascade where 44 per cent of the young ponderosa pine trees sampled were infested.

Bruce Spanworm, *Operophtera bruceata* (Hlst.)—In 1959, this insect severely defoliated trembling aspens from Little Prairie to Blueberry. Willow and rose leaves and occasionally spruce buds were also eaten. Collections: Interior 25.