

PROVINCE OF BRITISH COLUMBIA

FOREST INSECT SURVEY

G. T. SILVER AND D. A. ROSS

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

INTRODUCTION

The year 1960 was highlighted by an exceptional number of insect problems, particularly in the coastal region. The saddle-backed looper, which has never been considered a serious pest in coastal forests, severely defoliated 14,000 acres of hemlock at Kitimat and some tree mortality will undoubtedly result. The green-striped forest looper, another species which has not been regarded as a threat to hemlock stands, increased to outbreak proportions on the west coast of Vancouver Island; at least 37 spot infestations were recorded with severe defoliation occurring in several areas.

The black-headed budworm infestation in the Queen Charlotte Islands, which had increased to a high level in 1959, declined to light intensity in 1960. The decline was attributed to heavy larval mortality as a result of the cold, wet spring and early summer.

The two-year-cycle spruce budworm infestation in central British Columbia expanded greatly, encompassing over 7,600,000 acres in the Prince Rupert and Prince George districts. Top kill is now evident in localities where the infestation has been at a high level since 1954, and some tree mortality has occurred.

The known range of the balsam woolly aphid expanded in 1960 as a result of more intensive aerial and ground surveys. Tree mortality continued in all localities. Predator releases were started in 1960.

The large number of red-topped Douglas fir in the Interior indicated that the Douglas-fir beetle attacks in 1959 were much heavier than anticipated. It is believed that 1960 attacks were again numerous, but this cannot be verified until 1961.

Other insects which were more abundant than usual were the western hemlock looper, oak looper, and *Neodiprion* sawflies on conifers. Important new problems were an increase in terminal damage to Sitka spruce in the Queen Charlotte Islands, and to Douglas fir on Vancouver Island, the causes of which have not yet been clearly established.

Defoliating insects were unusually scarce in the Interior in 1960.

The Victoria Laboratory received 2,563 insect collections and the Vernon sub-laboratory 2,955 for a total of 5,518. Collections received during 1960 were distributed among the principal tree species as follows:

Coniferous Trees	Collections	Broad-leaved Trees	Collections
Hemlock		Poplar	
Western hemlock.....	992	Trembling aspen.....	240
Mountain hemlock.....	6	Black cottonwood.....	142
	998	Silver poplar.....	1
Douglas fir.....	879	Miscellaneous poplars...	17
			400
Spruce		Alder	
White spruce.....	329	Red alder.....	78
Sitka spruce.....	240	Mountain alder.....	43
Englemann spruce.....	159	Sitka alder.....	19
Black spruce.....	52	Green alder.....	1
Miscellaneous spruce.....	21	Miscellaneous alders.....	73
	801		214

Coniferous Trees		Collections	Broad-leaved Trees		Collections
Pine			Birch		
Lodgepole pine.....	409		White birch.....	59	
Ponderosa pine.....	144		Dwarf birch.....	32	
Western white pine.....	86		Water birch.....	19	
Miscellaneous pines.....	28		Western white birch.....	7	
		667	Miscellaneous birches....	51	
Fir					168
Alpine fir.....	196				
Amabilis fir.....	94				
Grand fir.....	50				
Balsam fir.....	2				
		342			
Western red cedar.....	151		Garry oak.....	50	
Larch			Cherry.....	41	
Western larch.....	63		Willow.....	40	
Tamarack.....	30		Maple.....	23	
European larch.....	1		Dogwood.....	18	
Miscellaneous larch.....	4		Broadleaf maple.....	12	
		98	Arbutus.....	12	
Juniper			Apple.....	4	
Rocky mountain juniper..	37		Hazlenut.....	2	
Common juniper.....	12		Miscellaneous broad-leaved		
Miscellaneous junipers...	3		trees.....	18	
		52	Total.....	1,002	
Miscellaneous coniferous trees....	15				
Total.....	4,003				
Miscellaneous hosts or no hosts specified.....	513				
Grant Total.....	5,518				

IMPORTANT INSECTS

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The one-year-cycle spruce budworm outbreak in the Vancouver Forest District remained at a low level. No larvae or masses were found in the Lillooet River Valley where an infestation collapsed in 1959. Up to 14 larvae per three-tree beating sample were found at Hell's Gate in the Fraser Canyon, and up to 24 larvae per sample at Queen's Park, New Westminster, where larvae were present on Douglas fir, spruce, grand fir, western hemlock, and Norway spruce.

The spruce budworm population level increased at Kitimat where many balsam trees lost almost all their 1960 foliage and collections contained up to 100 larvae per sample. Defoliation extended from Kitimat north to Terrace. No egg masses were found in seven localities sampled, indicating a decrease for 1961.

A flight was made to check reports of an extensive spruce budworm infestation in the Telegraph Creek region, but poor weather hampered visibility. However, an infestation was observed in the Bob Quinn Lake-Ogilvie Creek area (of northern British Columbia) and defoliation extended over approximately 20 square miles. At the one locality ground-checked, 25 per cent of the buds were damaged. It is not certain if this is one- or two-year-cycle spruce budworm.

The one-year-cycle spruce budworm on Douglas fir was scarce in the Kamloops Forest District. A moderate infestation persisted along the Alaska Highway between Mileages 490 and 540.

The current two-year-cycle spruce budworm infestation is the most extensive recorded to date in central British Columbia. In the Prince Rupert Forest District light to heavy defoliation extended from west of the Bulkley River to Babine Lake, and from Taltapin Lake in the south to about 40 miles north of Nilkitkwa Lake. The outbreak expanded northward in the spruce alpine fir forests of the Prince George Forest District. Moderate to severe defoliation of the current year's growth extended from 30 miles north of the Nechako River

east from Babine watershed to the Rocky Mountains, along Finlay River to north of Fort Ware. South of Prince George a moderate infestation extended throughout the Willow River watershed to Wells. The area affected exceeds 7,600,000 acres.

The greatest damage was in the Babine Lake region where the infestation has been at a high level since 1954. Counts in May and June averaged 20 larvae per square foot of foliage surface, an increase of over 50 per cent compared with 1958. In many areas spruce and alpine fir lost 100 per cent of their 1960 foliage, and total defoliation averaged up to 80 per cent in some plots. Foliage examination in six plots showed about 85 per cent of the tips on spruce and alpine fir were killed. Top kill was prevalent on both tree species. Reproduction has been severely damaged; in some areas most of the spruce and alpine fir trees under six feet high were completely stripped and many are dead. The areas of heaviest damage are in the Nilkitkwa River Valley and between Chapman Lake and the Cronin Mine Road. Top kill is widespread and tree mortality has occurred in some areas, notably the Nilkitkwa River Valley.

The average number of egg masses per 100 square feet of foliage surface in 1960 was 144 on spruce, 105 on alpine fir, and 305 on lodgepole pine. The 1960 masses contained fewer eggs than in 1958. A comparison with some plots sampled in 1958 showed that egg mass numbers decreased an average of 82 per cent for spruce and 81 per cent for alpine fir. Comparative figures are not available for lodgepole pine but on the basis of total samples the number of egg masses per 18-inch branch sample decreased about 60 per cent compared with 1958. No defoliation of lodgepole pine occurred following the high egg counts of 1958 and it remains to be seen if the present egg population constitutes a hazard to lodgepole pine or if the larval population again fails to materialize.

The reduced egg counts may indicate a major decline in the outbreak in the Babine Lake area. However, in 9 of the 17 localities sampled the number of egg masses per 100 square feet of foliage surface exceeded 200, sufficient to result in extensive defoliation in 1961. Areas where high population levels are expected in 1961 are Hatchery Arm and Hagan Arm on Babine Lake, Taltapin Lake, Cronin Mine Road, and the Nilkitkwa River Valley.

The two-year-cycle spruce budworm persisted in low numbers in the sub-alpine forest of the Kamloops Forest District. Collections: Coast 141, Interior 143.

Black-headed Budworm, *Acleris variana* (Fern.)—The black-headed budworm infestation on the Queen Charlotte Islands decreased to a low level in 1960. The decline is attributed to the unusually cold, wet spring which adversely affected larval development. About 30,000 acres of valuable timberland in the Skidegate Inlet-Cumshewa Inlet area were sprayed with 1/4 pound of DDT per gallon per acre with good results.

A survey of the Queen Charlotte Islands during July indicated that larval numbers were decreasing significantly. The decrease was most conspicuous on Graham Island where samples averaged 21 larvae compared with 212 larvae per three-tree beating sample in 1959, a 10-fold decrease. The greatest numbers of larvae were found south of Cumshewa Inlet in the region from Louise Island to Ramsey Island. Here samples averaged 133 larvae each, a reduction of about 65 per cent compared with 1959. Light defoliation was observed on Ramsey, Lyell, Tanu, Talunkwan, and Louise islands.

Egg counts made at 23 localities south of Skidegate Inlet, which were sampled in 1959, averaged only 0.3 eggs per 10-inch tip. This decrease compares with the 9.7 eggs per 10-inch tip present in 1959. The greatest number of eggs, 4.2 per 10-inch tip, were found at Mosquito Lake. The outlook for 1961 is a very low population level and no defoliation.

The black-headed budworm was abundant on the coastal mainland section of the Prince Rupert Forest District from Lowe Inlet on Grenville Channel north to Observatory Inlet. Defoliation was noticeable at the head of Tuck Inlet and near the narrows where up to 270 larvae per sample were collected. The largest collection, 381 larvae, was made 2½ miles north of North Point in Observatory Inlet. Larvae were common in collections throughout the Vancouver Forest District, but the number of specimens per collection was small.

The black-headed budworm population level remained low throughout the Interior. Collections: Coast 197, Interior 10.

Saddle-backed Looper, *Ectropis crepuscularia* Schiff.—A severe outbreak of the saddle-backed looper occurred at Kitimat in 1960. No reports were received from this area in 1959, but a large moth flight occurred in May, 1960. The outbreak, 14,000 acres in extent, is confined to the west side of the Kitimat River and extends from 2 miles south of the smelter site to about 3 miles north of the railway station, and up the west slopes to about the 1,500 foot elevation which includes the Moore and Anderson Creek valleys. Defoliation was severe within the infestation area; nearly all coniferous and deciduous understory, including devil's club, was completely stripped. Many understory trees were completely defoliated and defoliation of the overstory hemlock was severe in several localities. Some tree mortality is expected at Sand Hill and in the Anderson and Moore Creek valleys.

About 1,800 acres were sprayed on August 1 with ½ pound of DDT per gallon per acre. From the standpoint of larval mortality the operation was not entirely satisfactory, but observations indicate that a considerable amount of foliage was saved.

Larval parasitism was light. The only parasite reared was *Dusona* sp. which emerges from the late-instar larvae and overwinters as a cocoon in the duff. A virus disease was also present, but did not become apparent in the field until most of the larvae were in the last instar.

In the Interior, a slight increase was detected along the North Thompson River, but there was no noticeable defoliation. Collections: Coast 103, Interior 48.

Green-striped Forest Looper, *Melanolophia imitata* Wlk.—The green-striped forest looper has never been regarded as a serious threat to western hemlock even when present in large numbers. However, in 1960 the looper increased to such a degree as to constitute a real problem. A total of 37 'spot' infestations ranging from 35 to 6,300 acres were detected on the west coast of Vancouver Island extending from Herbert Inlet to Nasperti Inlet. The total area involved was about 26,100 acres. The heaviest defoliation was on Villaverde Island where defoliation on individual hemlock trees ranged from 55 to 100 per cent, and averaged over 80 per cent.

Counts made in selected areas in October, 1960, showed that the number of overwintering pupae ranged from 0.5 to 2.1 per square foot of duff. The estimate for each area was based on 48 one-square foot samples. It is uncertain if this pupal population level represents a threat to the infested stands in 1961 as there is no basis for comparison.

The population level of the green-striped forest looper was higher than normal throughout the rest of Vancouver Island, but defoliation was light. The population level decreased on the mainland portion of the Vancouver Forest District.

This was the most numerous and widely collected looper in the Kamloops and Nelson Forest districts during July; however, it caused no appreciable defoliation. Collections: Coast 358, Interior 133.

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—The known range of the balsam woolly aphid in British Columbia increased in 1960. The infestation now includes the region between Indian Arm and Burrard Inlet, and the stands surrounding Howe Sound as far north as Madeira Park on the Sechelt Peninsula. Infested trees were found at Chapman Creek, McNair, McNab, Woodfibre, and Hill creeks. Possible gout was observed from the air in the Indian River Valley, and Cheekye River, and Mashita and Ring Creek valleys. No new infestations were found on Vancouver Island.

The attack appears to be mainly the 'gout' form as relatively few stem attacks were found except at Grouse Mountain and Mt. Seymour. Red-top trees were fewer than in 1959, but an aerial survey indicated a total of 5,300 trees to be dead, dying, or attacked. Tree mortality is particularly evident at Woodfibre Creek, Cypress Creek, and Seymour Mountain but is very light in other areas.

Ten species of native predators or suspected predators have been found in 1959 and 1960, some only in small numbers. The following species of introduced predators were released in 1960 at Seymour Mountain or Thetis Lake, Vancouver Island; *Laricobius erichsonii* Rosenh., *Aphidecta obliterated* L., *Scymnus pumilio* (Ws.), and *Pullus impexus* Muls.

Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopk.—The great number of Douglas-fir trees that had reddened by the late spring of 1960 clearly demonstrated that estimates of the 1959 infestations were often too conservative. New red-topped Douglas-fir trees were particularly numerous in the Cariboo where the beetle has expanded its depredations westward from Williams Lake across the Chilcotin District. The most spectacular increase occurred in the Cache Creek-Clinton region. Farther south, near Westwold, recent tree mortality at Ingram Creek was very noticeable. In the Narcosli Creek-Blackwater River area, Prince George District, and in the west portions of the Nelson Forest District, more red-tops were apparent than heretofore.

Although indications are that the Douglas-fir beetle remained abundant in 1960, this can not be confirmed until the attacked trees redden in 1961. Appraisals of commercial-sized Douglas-fir trees killed by *Dendroctonus* in 1957-1959 were made from vantage points on the ground and from aircraft in the late summer of 1960. Counts in areas of greatest attack were as follows: Aspen Grove to Princeton—200, Bear Creek—250, Ingram Creek—750, Westwold to Monte Creek—300, Tunkwa Lake to Highland Valley—400, and Narcosli Creek—1,000. The following comparative figures, with the 1959 counts in brackets, illustrate the increase in the number of red-topped trees: Cache Creek—4,280 (952), Riske Creek—1,540 (444), and Joes Lake—1,550 (338). The largest increase was at Joes Lake where a fivefold increase was recorded.

Approximately 10 per cent of the scorched Douglas-fir trees in a 400 acre burn adjacent to Myra Creek on Buttle Lake, Vancouver Island, were attacked by the Douglas-fir beetle. No attacks were observed in green trees.

Small groups of Douglas-fir trees have been attacked at Anderson Creek, the Skagit River Valley, and in the Lillooet River Valley.

Mountain Pine Beetle, *Dendroctonus monticolae* Hopk.—In 1960 the mountain pine beetle continued its depredations in lodgepole, white, and ponderosa pines in most of the areas infested in the preceding year. In the Nelson Forest District lodgepole pine trees killed in 1959 were observed, notably, at Coyote and Elk creeks, Boundary and Windfall creeks, Enterprise Creek, and along the upper Kettle River. A light infestation persists at Steamboat Mountain. Strip surveys in the Takla Lake pine belt, Prince George Forest District, showed that the beetles are still active but not epidemic there.

White pine trees were attacked and killed in 1959 in the following localities: Dolly Varden Beach and Kingfisher Creek near Mabel Lake (157 trees), Scotch Creek north of Shuswap Lake (63 trees), and Malakwa (21 trees). Only 22 trees were attacked in 1959 between Blue River and Gosnell along the North Thompson River indicating a decline from previous years. There was also a slight decline along the Big Bend of Columbia River. Infestations in white pine persisted about upper Arrow Lake, particularly in the following localities; Arrowpark to Fosthall Creek, Akolkolex River, and from Nakusp to St. Leon Creek.

Very few ponderosa pines were attacked. A small number of trees were infested near Long Lake, southeast of Westwold, and at Alleyne Lake.

Scots pine trees near Pritchard were killed by the mountain pine beetle, presumably the first such occurrence in British Columbia. Four of 10 trees, (6) to (8) inches D.B.H. attacked in 1959 had died by June 1960.

Considerable white pine mortality has occurred over a 10-square-mile area in Manning Park. Heavy white pine mortality was also observed in the Squamish River Valley, on the Sechelt Peninsula, and throughout Vancouver Island.

Engelmann Spruce Beetle, *Dendroctonus engelmanni* Hopk.—The Engelmann spruce beetle persisted at a low population level in southern British Columbia.

Alaska Spruce Beetle, *Dendroctonus borealis* Hopk.—Personnel of the British Columbia Forest Service sprayed 55,000 cubic feet and peeled 75 per cent of the surface of an additional 194,000 cubic feet of beetle-infested white spruce logs near Hay Lake in the central Interior. The spray consisted of a diesel oil emulsion of ethylene dibromide applied early in June. Peeling was done between May 26 and June 27. The treatments eliminated the hazard presented by the large number of bark beetles in the logs.

A Spruce Beetle, *Dendroctonus* sp.—About 500 acres of white spruce trees adjacent to an old burn in the Bob Quinn Lake—Ogilvie Creek area in northern British Columbia were heavily attacked by an unknown species of bark beetle. Spruce up to 36 inches D.B.H. contained beetles and the outbreak appears to be continuing. Other apparently infested spruce stands were observed from the air in this northern region.

Western Pine Beetle, *Dendroctonus brevicomis* Lec.—In 1960 a few small groups of mature ponderosa pine trees were killed by the western pine beetle in the Kamloops Forest District near Penticton, between Princeton and Aspen Grove, and at Alleyne Lake.

Lodgepole Pine Beetle, *Dendroctonus murrayanae* Hopk.—This species was observed in the root collar of lodgepole pine trees in the Yukon Territory. Scattered patches of dead trees infested by *D. murrayanae* occurred along Annie Lake Road, near Whitehorse.

Red Turpentine Beetle, *Dendroctonus valens* Hopk.—One dead and two living 10-inch d.b.h. Scots pines near Westwold were infected by the red turpentine beetle. The dead tree apparently has been infested for the past two or three years.

Larch Bark Beetle, *Dendroctonus simplex* Lec.—The larch bark beetle infested two of three flood-damaged eastern larch trees south of Fort Nelson. On July 15 these trees contained parent adults and larvae; on August 19 pupae and callow adults were present. On June 1 and 29 a fallen tree near Wildmare Creek was infested with numerous parent beetles and larvae. These constitute the first record of *D. simplex* in British Columbia.

Ambrosia Beetles, *Trypodendron lineatum* (Oliv.), *Platypus wilsoni* Sw., and *Gnathotrichus* spp.—*Trypodendron* again occurred in large numbers around logging operations on the Coast and on the Queen Charlotte Islands. The spring attacks at Lake Cowichan, Vancouver Island, occurred over a rather prolonged period from April 7 to June 8, probably due to the wet, cold weather of April and May. All the boomed logs on Lake Cowichan and many logs in other coastal regions were sprayed by helicopter during April to prevent damage. *Gnathotrichus* was common in the areas observed, but not as numerous as *Trypodendron*.

Platypus wilsoni, which is normally rather scarce, was numerous in a group of dead and dying amabilis fir in Copper Canyon, Vancouver Island.

In the Interior, *Trypodendron* severely infested unpeeled cedar poles near Graham Landing and Sugar Lake. Sprays applied after attack helped to reduce the amount of damage. Light ambrosia beetle infestations occurred in spruce logs at Jamieson Creek and Sock Lake.

Oregon Pine Engraver, *Ips oregoni* (Eichh.)—This species of *Ips* was abundant in tops and limbs of ponderosa pines logged in the late winter of 1959 and spring of 1960 near Okanagan Landing, and on the Salmon River Indian Reserve. A small group of ponderosa pine trees was killed by *I. oregoni* two miles south of O'Keefe. *Ips emarginatus* Lec. was frequently found with *I. oregoni*.

Since 1955, over 200 mature ponderosa pine trees have been killed by *Ips* beetles in combination with *Dendroctonus brevicomis* and *D. valens* in the Little Shuswap Lake area.

Oregon Fir Sawyer, *Monochamus oregonensis* Lec.—Although much timber was killed by forest fires in the Interior during 1960, relatively few standing burnt Douglas fir and spruce trees were infested by *Monochamus*. Most of the fires occurred after mid-July when the major flight of *M. oregonensis* was over. Spruce trees killed early in the summer of 1958 in the Lin and Fir fires, Prince George area, were heavily attacked. Of the total sawyer beetle emergence to September 1960, 51 per cent emerged in 1959, and 49 per cent in 1960.

Douglas fir, larch, and spruce trees at Gold Creek, St. Mary's Lake, and Galbraith Creek killed by fire in mid-July 1960 were examined for borer damage in mid-September. With one exception (one *Monochamus* larva) the *Monochamus* and buprestid larvae were still feeding in the cambium and had not begun to bore into the sapwood.

A Pine Sawyer, *Monochamus* sp.—Near Vernon, moderate to severe infestations of *Monochamus* were observed in ponderosa pine stands killed by fires started July 7, 1960. Most of the larvae were well into the wood by mid-October.

Pine Butterfly, *Neophasia menapia* Feld.—In 1959 a spectacular pine butterfly flight occurred at Cathedral Grove (MacMillan Park) on Vancouver Island. Counts made in November, 1959, averages 7.4 eggs per square foot of foliage surface. Defoliation was light in 1960, averaging about 20 per cent, but nearly all the 1959 foliage was lost and there was some back feeding on the 1958 foliage. Very little feeding occurred on the current year's growth where the eggs are laid.

An even heavier butterfly flight occurred in 1960, and the number of eggs in the same locality increased about 2½ times. The infested area is reserved as a showplace and a tourist attraction with some over-mature Douglas fir and balsam up to 10 feet in diameter and over 200 feet high. Because of the aesthetic value of the stand, chemical control may be applied in 1961.

The number of eggs was low in the Cameron River Valley and at Dunsmuir Creek, Nanaimo Lakes, but the population trend was upward. Collections: Coast 11, Interior 2.

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hlst.)—The population level of this species remained above average in the coastal forests. The largest number of larvae collected was at Dahlstrom Point in Holberg Inlet, Vancouver Island, where 52 larvae per sample were taken from western hemlock and 51 larvae from spruce. Defoliation was light and only a few eggs were found in November. Larvae were abundant at Powers River, Vancouver Island, in association with *Melanolophia imitata*. Egg counts averaged only 2.1 per $\frac{1}{2}$ square foot of bark surface, considerably below the 10 calculated to represent a hazard.

Larvae were common throughout much of the Vancouver Forest District and the South Prince Rupert District, but the number of larvae per collection was small. The population at Stanley Park, Vancouver, which was sprayed in 1959, was low.

The hemlock looper in the Interior increased along the Big Bend Highway and North Thompson River, although it did not cause noticeable defoliation. A decline was detected in the Quesnel Lake area. Collections: Coast 78, Interior 55.

Oak Looper, *Lambdina somniaria* (Hlst.)—Garry oak trees were severely defoliated in a localized area in Victoria bounded by Douglas Street, Rogers Avenue, Quadra Street, and McKenzie Avenue. Nearly all oaks on Christmas Hill were completely defoliated. Feeding also occurred on coniferous trees with defoliation of grand fir up to 90 per cent and Douglas fir up to 80 per cent. Some coniferous trees were sprayed by home owners to prevent mortality.

Parasitism was very light, but a virus disease caused considerable mortality in 1960. Collections: Coast 10.

Poplar and Willow Borer, *Sternochetus lapathi* (L.)—Attacks continued in the mainland portion of the Vancouver Forest District as far north as Madeira Park on the Sechelt Peninsula. Willow, the preferred host, has been attacked from sea level to 3,000 feet. The heaviest damage observed was at Chapman Creek.

This borer is a ubiquitous pest in the southern Interior. Among the larger infestations in willow are those at Larkin (about four acres) and between Falkland and Westwold where the infestation borders the Salmon River for about five miles.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—A forest tent caterpillar epidemic is apparently developing in the Interior. Trembling aspen trees at three centres near Golden suffered up to 50 per cent defoliation. Severe defoliation is also predicted for 1961 especially between Nicholson and Donald where up to 357 egg masses per tree were recorded.

Defoliation ranged up to 60 per cent in the McBride infestation. Egg sampling indicated that defoliation will be heavy in 1961.

Forest tent caterpillars caused severe defoliation between Hazelton and Kitwanga in the Skeena River Valley. Most aspen and other deciduous trees and bushes were almost completely defoliated. At one time so many larvae were crossing the highway at Skeena Crossing that driving conditions were reported as "slippery". Up to 160 egg masses were recorded per tree, indicating heavy defoliation can be expected in 1961. Collections: Coast 14, Interior 2.

Western Tent Caterpillar, *Malacosoma pluviale* (Dyar)—The population on the Saanich Peninsula increased in 1960, but there was no noticeable defoliation. The heavy infestation at Terrace has collapsed as only a few colonies were observed. Heavy defoliation occurred in the Ladner-Delta-Fraser Valley region in association with the forest tent caterpillar.

Population levels in the Interior remained low in 1960. Collections: Coast 18, Interior 16.

Silver-spotted Tiger Moth, *Halisidota argentata* Pack.—Webs of the silver-spotted tiger moth were again numerous on the southwestern portion of Vancouver Island, the Straits Islands, and on the mainland from Vancouver to Powell River. There was no severe defoliation in 1960. The population level, although relatively high, was below that of 1954. Overwintering colonies were very conspicuous in early November. The population level will probably be higher than normal in 1961. Collections: Coast 47.

Cooley Spruce Gall Aphid, *Adelges cooleyi* (Gill.)—This insect was at a high population level on Douglas fir reproduction in many localities in Coastal British Columbia. Heavy infestations on spruce were reported in the Nusatsum Valley, Bella Coola, and the south end of Babine Lake. The occurrence of *Adelges cooleyi* on the Queen Charlotte Islands has caused considerable concern because of the valuable spruce stands. Douglas fir, the alternate host, is not indigenous to the Islands. A few planted Douglas fir still remain on Maude Island. Further planting of Douglas fir will be discouraged.

There was an obvious decline in aphid numbers on Douglas fir and spruce throughout the Interior, but newly formed galls were common on spruce.

Other Woolly Aphids on Conifers, *Adelges* spp.—One or two hemlock shade trees were heavily infested by *A. tsugae* Annand in Revelstoke and Sicamous. A few mature hemlock trees along Goat River, 2 miles west of Kitchener, were lightly infested by this insect. Woolly aphids were common on western hemlock in Bella Coola and about 6 miles up the Bella Coola Valley.

A moderately severe outbreak of *A. oregonensis* Annand was noted on western larch reproduction in the lower valley of Hallmark Creek, Creston Ranger District.

Woolly aphids were numerous on lodgepole pine reproduction over $1\frac{1}{2}$ acres near Three Brothers Game Reserve. Needles on infested tips were discoloured and dropped when touched.

It is believed that a new species of *Adelges* has been found on amabilis fir at Kitimat.

Satin Moth, *Stilpnotia salicis* (L.)—There was a further reduction in satin moth numbers in the Okanagan Valley in 1960; only a few trees or small groves of trees were moderately to severely defoliated. Near Kamloops only three groves of aspen were defoliated; south of the city several groves near Stump Lake were denuded. Collections: Coast 0, Interior 2.

Conifer Sawflies, *Neodiprion* spp.—Excepting the species on hemlock, *Neodiprion* sawflies on conifers were generally scarce during 1960. The hemlock sawfly was numerous near Cherryville, Sugar Lake, and Kingfisher Creek in the Kamloops District, along the Big Bend Highway, and at one point on Haines Road. Defoliation was very light.

Neodiprion sawflies were numerous throughout the Vancouver Forest District and the South Prince Rupert District. Defoliation was observed on

amabilis fir in a localized area near Comox Lake and Eric Creek. Sawflies defoliated nearly all the 1959 foliage on the upper crowns of most lodgepole pine in an area of over 600 acres at the north end of Chilliwack Lake. The damage should not be serious unless the infestation continues in 1961.

Neodiprion sawflies caused light to medium defoliation of mature and overmature hemlock between Burnett and Angus creeks. The heaviest feeding was confined to an area less than 1 mile in extent. Up to 1,170 larvae per three-tree beating sample were collected in this area. This is the heaviest outbreak of this insect encountered for several years. Collections: Coast 433, Interior 306.

Fir Engraver, *Scolytus ventralis* Lec.—Dead and dying grand fir trees were common on Vancouver Island from Sooke to Courtenay on the east coast, and on the west coast between Nitinat Lake and Port Alberni. The heaviest mortality occurred in the Chemainus River Valley where about 400,000 bd. ft. of grand fir were salvaged, about half of which had been killed by this beetle. A large number of grand fir trees in the Saanich Peninsula died in 1960. Trees from 6 inches D.B.H. and up are attacked.

Examination of dead trees show that this beetle has been present throughout the infested area for some years. Attacks on individual trees are localized in that galleries are usually restricted to an area up to 4 feet long and seldom more than half the circumference of the bole. Trees may be attacked up to five or more successive years before being girdled.

Western Cedar Bark Beetle, *Phloeosinus punctatus* Lec.—No new attacks were found in 1960. Buprestids attacked several cedar trees at Silverdale which were apparently dying as a result of last year's attack; the trees are now dead. Scattered dead trees and considerable top killing were observed on all the Gulf Islands with the heaviest damage being done on Galiano, Mayne, and Salt Spring islands.

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.—The aspen leaf miner remained abundant throughout most of the Interior and into the Yukon Territory. A noticeable increase occurred in the Cariboo; a decrease was observed in most of the Kamloops Forest District south and east of the Cariboo, and in the Liard River Valley, Prince George Forest District. Numbers increased slightly in the eastern part of the Nelson Forest District.

Serpentine Miners, *Phyllocnistis* spp.—A leaf miner of this genus was abundant on black cottonwood trees in several widely scattered localities: Edgewood and Revelstoke, B.C., and at Watson Lake and Rancheria River in the Yukon Territory.

A *Phyllocnistis* sp. in willow foliage increased slightly in abundance in the Liard River Valley, between Smith and Coal Rivers.

Fall Webworm, *Hyphantria cunea* (Drury)—The fall webworm was numerous in the southern part of the Kamloops Forest District; elsewhere in the Interior it was, at most, only in light infestation proportions. There was an increase in the number of tents in Spences Bridge area, and the North Okanagan. In the latter area tents were larger than in 1958 and 1959. The population in the Rocky Mountain Trench of Nelson Forest District declined to a low level.

The fall webworm was common between Oyster River and Courtenay on Vancouver Island. A threefold increase was recorded by roadside counts at Chilliwack and Cultus Lake, and Pirdonville on the mainland. Webs were also common on all deciduous trees on the Sechelt Peninsula. Collections: Coast 4, Interior 5.

Sitka Spruce Weevil, *Pissodes sitchensis* Hopk.—This weevil continued to attack Sitka spruce regeneration throughout the coastal region in 1960 particularly in the Nitinat River Valley. Although attacks are usually restricted to trees under 50 feet high a considerable number of trees in the West Prince Rupert District over this height have been attacked. A height record was established when the terminal on a 100 foot spruce tree was attacked and killed. There are no records of this weevil from the Queen Charlotte Islands.

Root Collar Weevils, *Pissodes* spp.—*Pissodes costatus* Mann. killed a number of white pine seedlings in the Arrow Lakes Valley and at Kaslo. *P. schwarzi* Hopk. infested and killed four or five blue spruce, *Picea pungens* Eng., seedlings in a nursery at Creston.

Alder Flea Beetle, *Altica ambiens* (Lec.)—Localized but severe defoliation of alder by flea beetles was observed north of Vernon near Larkin, at the mouth of Salmon River, and on the west side of Kalamalka Lake. Moderate defoliation was noted along Simna Creek.

Rusty Tussock Moth, *Orgyia antiqua badia* (Hy. Ed.)—The rusty tussock moth has been found in small numbers in the Quatsino Sound—Holberg Inlet region of northern Vancouver Island since 1956. In 1960 an increase was evident, and a small spot infestation was detected on the southwest side of the panhandle of Drake Island in Quatsino Sound. Up to 133 larvae per three-tree beating sample were collected. Western hemlock is the preferred host but larvae were collected from Douglas fir and Sitka spruce. Collections: Coast 40.

Pine Needle Scale, *Phenacaspis pinifoliae* (Fitch)—Light infestations of pine needle scale persisted on ponderosa pine in most parts of South Okanagan. A few small groups of trees near Kaleden and Summerland were severely infested: parasitism and predation in these areas was heavy.

The numbers of scales on ponderosa pine for 3 miles along the Mamette Lake road north of Nicola increased considerably.

Black Pine-leaf Scale, *Nuculaspis californica* (Col.)—The black pine-leaf scale population level on ponderosa pine continued to decline at Campbell Mountain and Penticton. Scattered lightly infested trees were observed east of Naramata. The light infestation in Botanie Valley also decreased.

A new locality record for this pest was obtained with the discovery of a few severely infested trees at Kushkanook on the shore of Kootenay Lake.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)—Light to severe infestations recurred along the Yukon section of the Alaska Highway. Defoliation at Mile 1205 increased in severity.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Larch sawfly numbers on tamarack again increased slightly in the Peace River district. No larvae were collected on western larch in southern British Columbia.

Willow Leaf Blotch Miner, *Lyonetia saliciella* Busck—Moderate to severe foliage damage by this blotch miner was again widespread in the Nelson Forest District. The most severe damage by *Lyonetia* sp. occurred on birch about Trout Lake, Nelson Forest District.

Douglas-fir Needle Miners, *Contarinia* spp.—Light infestations persisted throughout much of the range of Douglas fir. Recent studies at Vernon by S. F. Condrashoff have shown that three species of *Contarinia* attack needles of current growth.

Sequoia Pitch Moth, *Vespamina sequoiae* (Hy. Edw.)—Lodgepole pines in the Cheakamus River Valley north of Cheekye in the South Vancouver District were heavily infested with the pitch moth. Young trees averaging about 5 inches D.B.H. had been attacked from one to six times. Some trees are deformed and others nearly girdled.

Alder Sawfly, *Hemichroa crocea* (Fourc.)—A small infestation of the alder sawfly occurred at Mile 10 on the Alice Lake Logging road in the Sechelt Peninsula. Light defoliation was observed near Westview. Defoliation also occurred in the University of British Columbia Forest at Haney, and from Coquitlam Lake to Bedwell Bay. Collections: Coast 18, Interior 4.

European Pine Shoot Moth, *Rhyacionia buoliana* (Schiff.)—Pines at 22 nurseries and other points across southern British Columbia from Victoria to Creston were carefully examined in 1960 but the European pine shoot moth was found only in Greater Vancouver. Although Mugho and Austrian pines in two Vancouver nurseries were infested in 1959 a control program appears to have been successful.

Green Velvet Looper, *Epirrita autumnata* (Con.)—Larvae of this looper were common throughout the Vancouver and Prince Rupert Forest districts in 1960. No collections exceeded 25 larvae per three-tree beating sample. Collections: Coast 113, Interior 18.

Spruce Tip Moth, *Zeiraphera diniana* Gn.—Feeding by the spruce tip moth was conspicuous in several coastal areas in 1960. Twenty-five per cent of the spruce buds in the Zeballos River Valley, and 20 per cent in the Tahsis Inlet area, Vancouver Island, were infested. Some buds contained up to three larvae. Between 50 and 75 per cent of the buds on young amabilis fir at Granite Lake in the North Vancouver District were damaged by larval feeding. Feeding was also noticeable on Sitka spruce on Malcolm Island. Collections: Coast 29, Interior 5.

Sitka Spruce Terminal Damage—In the Queen Charlotte Islands sitka spruce reproduction up to 30 feet in height is being severely damaged. The terminal bud is killed before growth starts in the spring, resulting in multiple leaders and forked stems. An average of 40 per cent of the trees tallied on four plots between Cumshewa Inlet and Skidegate Inlet were affected. There was evidence of insect damage in some dead buds and a fungus, *Cephalosporium* sp., was isolated from others. The cause of death of many buds was not apparent.

Douglas-fir Terminal Damage—A large proportion of the terminals on second growth Douglas fir trees on southern Vancouver Island are being killed or broken. Some of this damage is the result of mining by *Dioryctria* sp., but many terminals show no evidence of insect attack.

Twig-infesting Cecidomyiids, *Cecidomyia* spp.—The midges that recently caused severe 'flagging' of ponderosa pine twigs decreased in abundance in the East Nelson district; a less pronounced decline occurred in other portions of the Nelson District and in the Kamloops Forest District.

The species infesting lodgepole pine twigs and candles were particularly abundant in the Beaverdell Ranger District.

Spruce Seedworm, *Laspeyresia youngana* Kft.—The spruce cone crop was generally light in British Columbia and Yukon Territory and the spruce seedworm was present in most collections sampled. It was most numerous in Yukon where 26 to 96 per cent of the samples contained *Laspeyresia*.

A Weevil in Western Red Cedar, *Hexarthrum* sp.—For the second successive year weevils, *Hexarthrum* sp., were collected in small numbers at several mills along the Big Bend Highway. *Hexarthrum* bores deep, narrow-diameter tunnels in overmature cedar trees rendering the wood unsatisfactory for shingles.

The Prominents, Notodontidae—Some members of this family of broad-leaved tree defoliators were more numerous than usual. *Schizura concinna* (S. & A.) colonies were frequent along roadsides in the wetter portions of the Kamloops and Nelson forest districts. *Datana ministra* (Drury) was common throughout the lower elevations of Okanagan Valley.

Leaf Rollers on Aspen, *Pseudexentera improbana oregonana* Wlsh.—This was the most abundant of several leaf rollers found on trembling aspen in the Interior. Defoliation was most evident in the Rocky Mountain Trench.

Leaf Eating Beetles, Chrysomelidae—*Chrysomela scripta* Fab. denuded a grove of Carolina poplar saplings near Winfield. *Chrysomela semota* Brown severely defoliated a patch of black cottonwood seedlings near Trutch on the Alaska Highway.

Light to moderate defoliation of willows for about seven miles along Bonanza Creek was attributed to feeding by *Gonioctena* sp.

Spruce Spider Mite, *Oligonychus ununguis* (Jac.)—The spruce spider mite severely infested several young Engelmann spruce trees in Vernon. The trees had been transplanted from the forest to very dry sites.

OTHER NOTEWORTHY INSECTS

Insect	Host	Locality	Remarks
<i>Erannis vancouverensis</i> Hlst.....	Garry oak, maple, birch, alder	Adams Lake Victoria	Localized infestations collapsed in 1960.
<i>Hyllobius</i> spp.....	White pine	Between Nakusp and Galena Bay	Damaged many roadside seedlings.
<i>Orgyia pseudotsugata</i> (McD.)....	Douglas fir	Kamloops Forest District	Low population levels persist.
<i>Scolytus</i> spp.....	Grand fir	Blewett, and Creston Ranger District	Caused scattered mortality to pole-sized trees.
<i>Lithocolletis</i> sp.....	Trembling aspen	Liard River Valley	Infestation increased in area.
<i>Archips cerasivoranus</i> (Fitch)	Cherry	Interior B.C	Declined to a low population level.
<i>Coleophora laricella</i> (Hbn.).....	Larch	Southern Interior	Present in northern Idaho but not detected in B.C.
<i>Nepytia</i> sp.....	Douglas fir	Nelson Forest District	The false hemlock looper remained at a low population level.
<i>Operophtera bruceata</i> (Hlst.).....	Trembling aspen, willow	Northern B.C.	Infestations collapsed in 1960.