

ANNUAL DISTRICT REPORT
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1969
PART I, VANCOUVER FOREST DISTRICT
VANCOUVER ISLAND SECTION

by
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INTRODUCTION

This report outlines the status of forest insect and disease conditions in the Vancouver Forest District, Vancouver Island Section, for 1969 and, where possible and meaningful, attempts to forecast pest population trends. It places regular stress on the level of pest populations capable of sudden, damaging outbreaks. Data on the occurrence and intensity of other pests, characterized by more insidious but often greater ultimate losses, are occasionally included but usually such information is presented more significantly in specific reports distributed by this Laboratory.

Reports of forest pest outbreaks to the Forest Insect and Disease Survey by public or private cooperators help greatly in the interpretation of the general pest situation and improve our ability to gauge population trends.

Regular field work in the District this season began on May 12 and ended August 15. Special surveys were as follows: May 12-23, green-striped forest looper pupal survey in Quatsino area; June 17-27, assessment of green-striped forest looper populations in the Quatsino area; July 14-18, aerial survey of the west coast and north end of Vancouver Island; July 2-11 and July 21-30, assessment of black-headed budworm infestation, Jordan River to Port Alberni; August 25 - September 23, dwarf mistletoe survey throughout District; September 30 - October 15, black-headed budworm egg survey, Jordan River to Port Alberni.

Insect and disease collections are shown, by host, in Table 1; collection localities and drainage divisions are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. The abbreviations for host trees used in this report are given in Appendix I.

Numbers of larval defoliators found in field collections increased greatly this year; 84% and 81% of beating collections in the northern and southern parts of the District, respectively, contained larvae. The green-striped forest looper caused severe defoliation in several areas around Victoria Lake and Neroutsos Inlet. Black-headed budworm populations increased, particularly between Jordan River and Port Alberni. The forest tent caterpillar defoliated deciduous trees and shrubs between Courtenay and Victoria and on the Gulf Islands.

Table 1. Collections by hosts, Vancouver Forest District,
Vancouver Island Section, 1969

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, Port Orford	0	3	Apple species	1	0
Cedar, western red	36	0	Alder, red	4	0
Cedar, yellow	0	1	Arbutus	1	8
Douglas-fir	159	21	Cherry species	2	0
Fir species	1	0	Cherry, bitter	1	0
Fir, alpine	1	0	Cottonwood, black	1	1
Fir, amabilis	30	8	Elm species	1	0
Fir, grand	17	2	Maple species	1	1
Hemlock species	0	1	Maple, broadleaf	2	0
Hemlock, mountain	4	1	Oak, Garry	10	0
Hemlock, western	311	87	Poplar species	2	8
Juniper species	1	0	Poplar, Lombardy	1	0
Larch species	1	1	Poplar, silver	1	0
Larch, European	0	1	Willow species	7	1
Pine species	2	13			
Pine, lodgepole	7	8			
Pine, ponderosa	2	1			
Pine, red	1	2			
Pine, Scots	0	3			
Pine, western white	5	1			
Spruce, Colorado	1	0			
Spruce, Norway	4	1			
Spruce, Serbian	0	1			
Spruce, Sitka	79	0			
Yew, western	0	1			
Totals	662	157	Totals	35	19
			Misc. hosts	16	11
			No hosts	62	0
			GRAND TOTALS	775	187

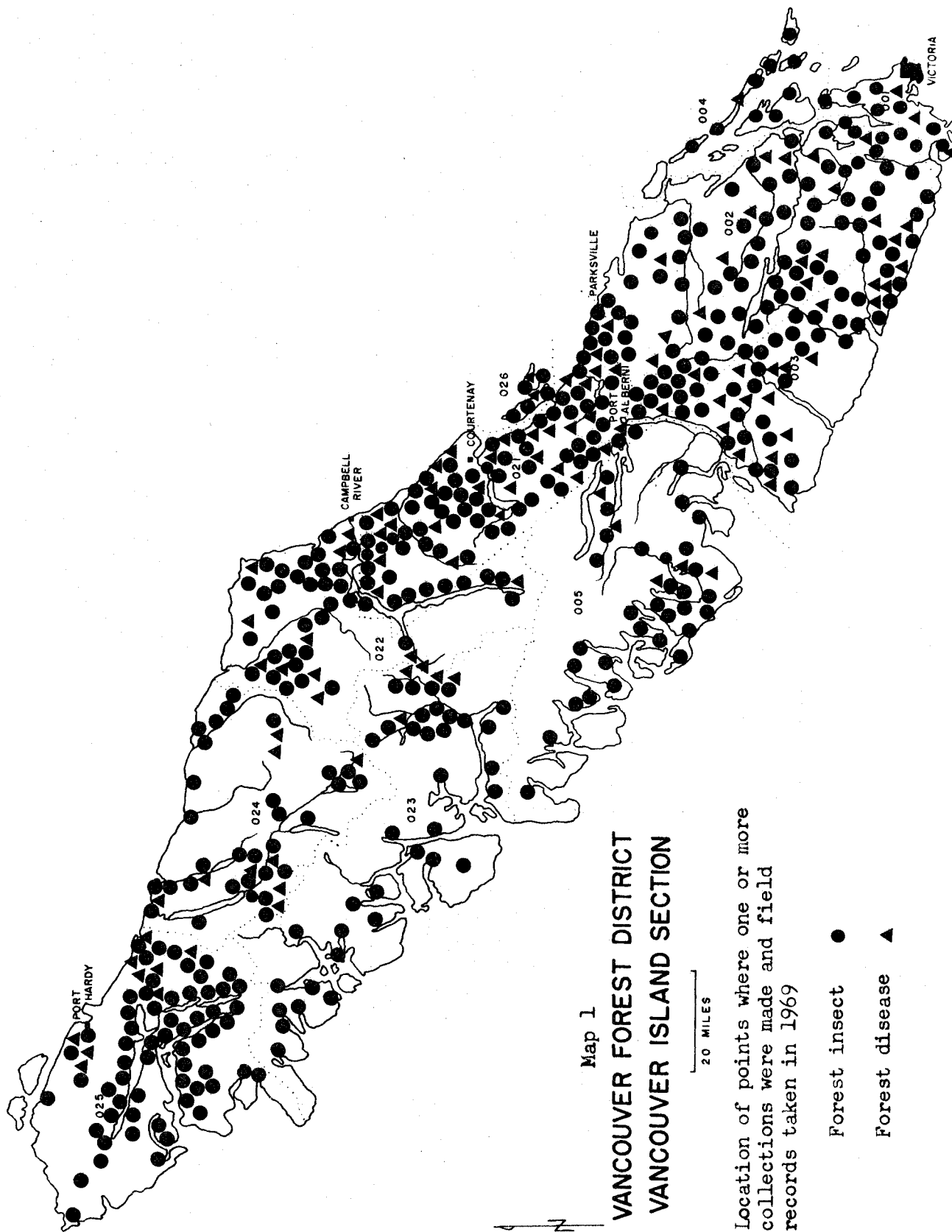
Table 2. Currently important insect and disease^{1/} problems by drainage division,
Vancouver Forest District, Vancouver Island Section, 1969

Insect and disease problems	Principal hosts ^{2/}	Importance by drainage divisions ^{3/}									
		001	002	003	004	005	021	022	023	024	025 026
<u>Defoliators</u>											
Green-striped forest looper	WH, aF, D, WC	2	2	3	2	4	2	2	5	2	5 2
Black-headed budworm	WH, aF	1	4	4	0	2	2	2	3	3	1 3 3 1
Western tent caterpillar	rAl, W	3	2	0	4	0	3	0	0	0	3 0 0 3
<u>Sucking Insects</u>											
Balsam woolly aphid	gF, aF	3	3	0	0	0	0	0	0	0	0 0 0 0
<u>Terminal Borers</u>											
Spruce weevil	sS	0	0	3	0	3	2	3	0	1	1 1 0
<u>Non-infectious diseases</u>											
Winter damage	WH, D Arb	0	0	0	3	0	2	2	0	1	1 4 1
		3	3	0	4	0	3	0	0	0	0 4

^{1/} Includes only weather-induced and foliage diseases which fluctuate annually.

^{2/} See host code in Introduction.

^{3/} High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.



FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Green-striped forest looper, Melanolophia imitata

Green-striped forest looper populations increased to infestation proportions in the Quatsino area (Drainage Divisions 023 and 025) in 1969. High numbers of larvae were found in 3 tree-beating samples, the highest numbers occurring at Julian Cove, 1,400 larvae; followed by Ketchen Island, 1,100; Ingersoll River, 1,000; east side Victoria Lake, 780; Teeta Creek, 740; and Victoria Lake (Pump Station), 400. A total of 91 collections in Drainage Division 025 averaged 175 larvae per sample; 36 collections in Drainage Division 023 averaged 80 larvae per sample (Table 3). The intensity of defoliation was usually, but not always, directly related to the numbers of larvae obtained in an area.

Small areas of immature and mature western hemlock were heavily defoliated in the Neroutsos Inlet and Victoria Lake areas. During aerial surveys in mid-July, heavy defoliation was mapped on some 1,700 acres around Kokwina, Atkins, Julian and Smith Coves, between Port Alice and Victoria Lake, along the southwest side of Neroutsos Inlet and on Ketchen Island (Map 2). Lighter defoliation occurred on approximately 10,000 acres from Coal Harbour south to Port Alice, the north end of Victoria Lake, and in several small areas southeast of Brooks Peninsula on Nasparti, Ououkinsh and Malksope Inlets.

Defoliation estimates were made from the ground on trees at various locations within the infestation area. In the heavily defoliated areas, 35% of the hemlock examined were completely defoliated, 12.5% were 98% and 7.5% were 90-98% defoliated. These trees stand little chance of recovering.

Overwintering pupae were numerous, especially where heavy defoliation had occurred (Table 4). At Julian Cove there was a high of 156 pupae in a one-square-foot duff sample, with 5% of all other samples containing more than 100 pupae each. There was an average of 33 pupae per square-foot duff sample in the infestation area, considerably more than double the number found in previous infestations. Previous records indicate that over 2 pupae per square foot constitutes a damaging population if the survival rate is high and subsequent adult emergence and mating in late May is successful.

Table 3. Summary of green-striped forest looper collections
by drainage divisions, Vancouver Forest District,
Vancouver Island Section

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1967	1968	1969	1967	1968	1969	1967	1968	1969
001	18	16	16	17	25	13	1.7	1.8	1.0
002	86	102	85	79	40	21	6.8	3.1	2.2
003	25	33	45	36	67	29	9.8	8.6	26.0
004	7	21	8	43	19	63	2.3	1.8	1.0
005	23	64	22	83	75	82	12.7	19.3	37.3
021	107	74	96	73	53	22	8.0	4.6	1.6
022	53	35	48	74	54	42	5.5	2.9	2.0
023	31	34	36	87	76	86	15.4	22.8	80.0
024	34	25	25	38	72	60	5.2	4.7	8.3
025	67	51	91	43	76	93	6.4	13.4	174.8
026	9	8	9	33	62	89	3.0	3.0	2.4
Totals	460	463	481	63	57	49	8.0	11.1	78.6

Table 4. Average number of green-striped forest looper
pupae per square-foot duff sample and ocular estimate
of per cent defoliation of western hemlock,
North Vancouver Island, September, 1969

Location	Average % defoliation	Average number pupae/square foot
Kokwina Cove	60	16.3
Atkins Cove	81	25.9
Julian Cove	88	63.6
N. end Victoria Lake	38	10.3
Pump station, Victoria Lake	55	31.7
Pipeline, Port Alice	91	39.6
Ketchen Island, Port Alice	72	59.2
W. side Neroutsis Inlet, S. of Port Alice	40	19.4

At the present time there is no sign of parasitism and little evidence of disease. A parasitic fungus, Cordyceps militaris (Fr.) Link, was found in only 3 of 6,000 pupae collected in November. However, unfavorable climatic conditions could result in some mortality of overwintering pupae and cause a reduction in the population before spring.

Unless populations are reduced, there will be an exceptionally high population in 1970, resulting in extensive additional spread of the infestation into surrounding areas and further defoliation.

Other areas showing damage from this pest were in the Clayoquot Sound area of Drainage Division 005, where high populations caused light defoliation, and at Millar Channel, where one beating sample contained over 500 larvae. No defoliation was visible from the air.

Black-headed budworm, Accleris variana

Populations increased from endemic to medium infestation levels in areas between Jordan River and Port Alberni (Drainage Division 002).

Defoliation was visible on western hemlock, mountain hemlock, amabilis fir and alpine fir. In most areas examined, about 10% of the 1969 foliage was affected.

Larval numbers in areas sampled ranged from 30 to 220 per 3 tree-beating sample (Table 5), indicating a marked increase from 1968. Of 86 samples taken in Drainage Division 002, 51% contained an average of 33.6 larvae per sample (Table 6).

Egg samples, taken in nine areas during October, ranged from 1 to 15 eggs per 10-inch branch sample. The highest numbers of eggs were found at Clapp Creek, Jump Creek summit, the north branch of Nanaimo River and Loss Creek (Table 5). These numbers of overwintering eggs mean an increased population in 1970, with more serious defoliation expected.

There was a general increase in larval population throughout the areas north of Campbell River in Drainage Divisions 022, 023, 024 and 025 (Table 6). Two collections of 25 larvae and 18 larvae were found at Victoria Lake and Haihte Lake, respectively.

Map 3 shows locations where black-headed budworm collections were taken.

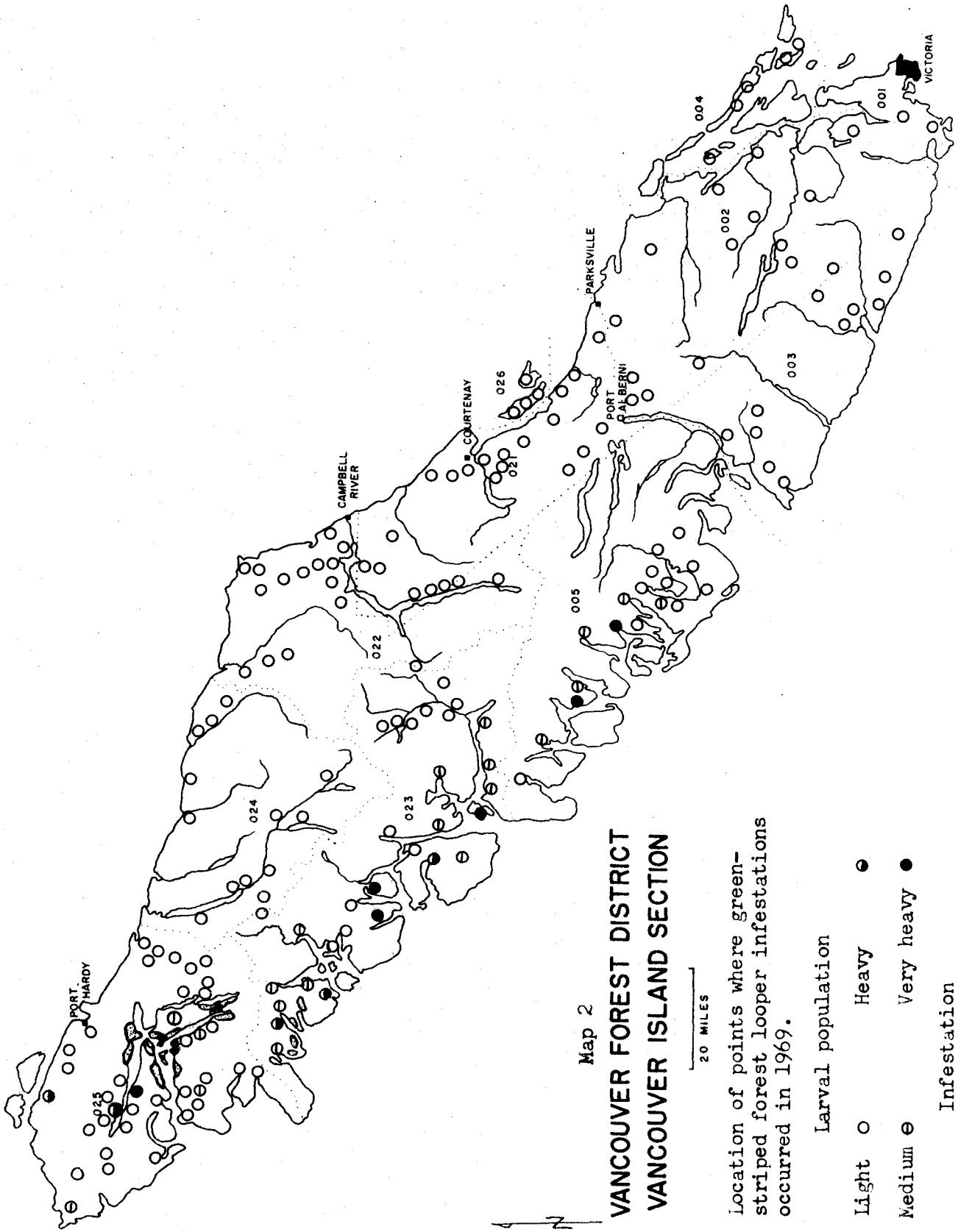


Table 5. Number of black-headed budworm per 3 tree-beating sample
and no. of eggs per 10" branch
Jordan River - Alberni area, 1967 - 1969

Location	Host	No. larvae			No. eggs/10" branch
		1967	1968	1969	1969
Bear Creek	WH	1	0	30	- <u>1</u> / ₁
Clapp Creek	WH	7	7	220	8.2
Weeks Lake	WH	0	0	43	3.8
Mt. Lazar	WH	-	-	-	1.4
Cottonwood Creek	WH	0	0	35	-
Lens Creek (E. & N. Line)	WH	0	4	48	-
Cameron Creek	WH	0	0	105	1.3
Museum - Nitinat R.	WH	0	0	90	3.0
Waterloo Mtn. W. side	WH	0	0	52	5.0
Jump Creek summit	WH	4	15	106	14.0
Jump Creek summit	aF	0	0	120	-
Nanaimo R. N. fork BR. p 1	WH	1	0	110	6.8
Marshall Creek	WH	0	0	82	-
Marshall Creek	aF	0	-	90	-
Loss Creek	WH	0	18	58	12.6
Total		13	44	1,189	1,029
Average		1.0	3.4	85.0	6.4

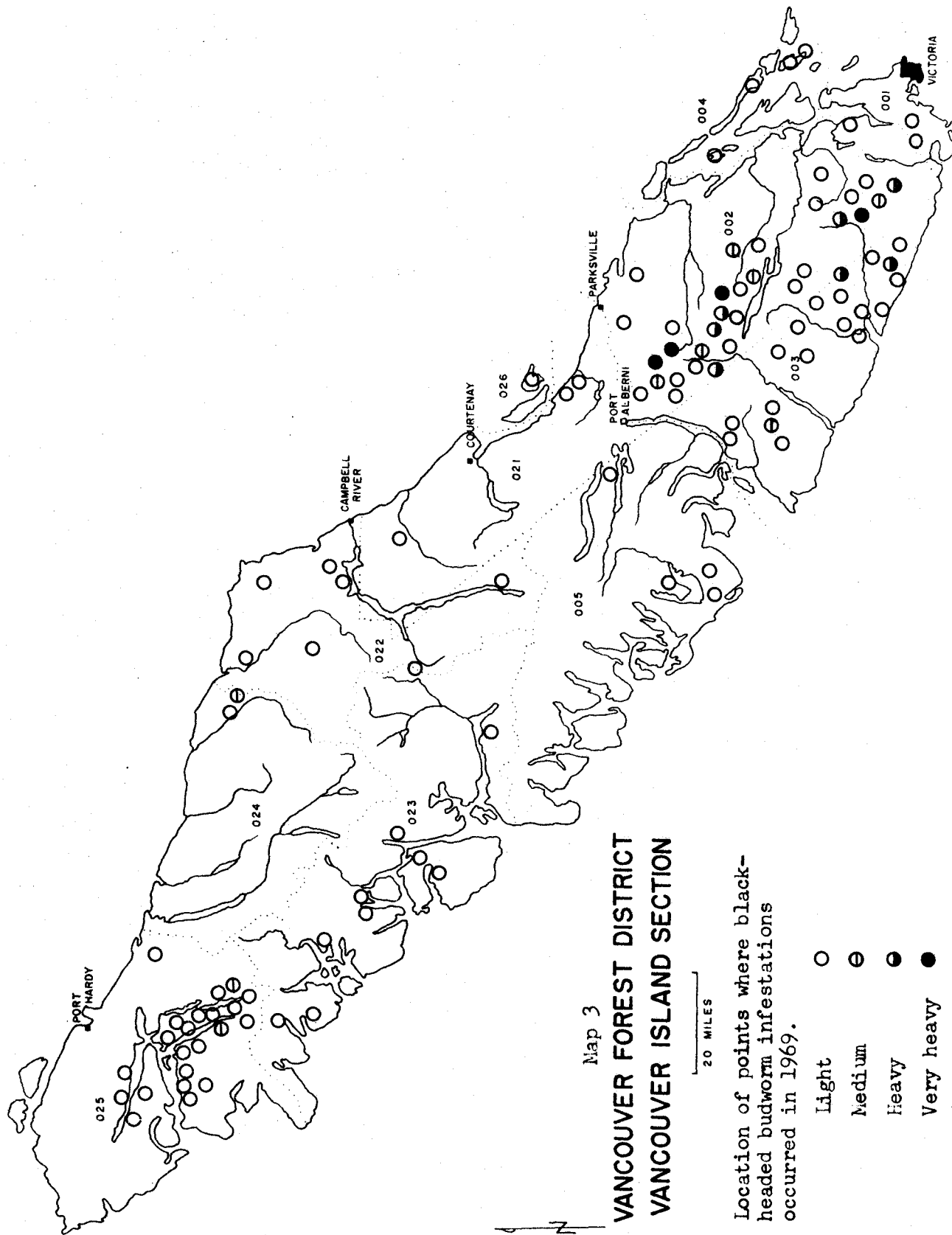
1/₁ No egg samples taken

Table 6. Summary of black-headed budworm collections
by drainage divisions, Vancouver Forest District,
Vancouver Island Section

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1967	1968	1969	1967	1968	1969	1967	1968	1969
001	16	10	16	0	33	6	-	8.0	1.0
002	87	109	86	36	26	51	3.2	2.7	33.6
003	25	38	45	20	10	58	3.2	4.4	9.5
004	7	21	8	0	2	0	-	1.0	-
005	23	64	22	4	14	18	1.0	2.0	2.0
021	114	74	114	14	10	4	2.2	1.3	1.8
022	53	35	48	6	11	15	3.3	1.5	2.1
023	35	34	36	14	15	28	1.4	1.8	5.1
024	35	25	25	9	4	8	1.0	1.0	10.5
025	61	51	91	3	12	40	1.0	1.7	3.4
026	9	8	9	11	38	11	1.0	2.3	1.0
Totals	465	469	500	14	17	27	1.9	2.5	14.5

Western tent caterpillar, Malacosoma pluviale

Larvae defoliated red alder, domestic apple, hawthorn, willow and other deciduous growth on Galiano and Mayne Islands, Saanich Peninsula, Comox Peninsula, Denman and Hornby Islands and in the Parksville area. The heaviest defoliation occurred on domestic fruit trees. Red alder and other native deciduous trees and shrubs were lightly defoliated and recovered quickly. Around 30% of the larvae collected were parasitized, and a nuclear polyhedrosis virus disease was found in three per cent of the larvae examined.



Terminal Borers

Spruce weevil, Pissodes strobi

A survey was conducted to determine distribution and intensity of spruce weevil attack in young Sitka spruce. Fifty trees were examined for 1967 and 1968 attacks in each of 26 areas. Nine of the areas were free of the weevil. Attack intensity was heaviest at Grice Bay road where 32% of the trees were attacked, followed by upper Nitinat River, 26%; Franklin River 22%; Lens Creek, 18%; lower Nitinat River, 18%; Menzies Bay, 16%; Sayward airstrip, 14%; and Campbell River, 12%.

Sucking Insects

Balsam woolly aphid, Adelges piceae

Three new areas of balsam woolly aphid attack on grand fir were found outside the known infestation boundaries. Two were located on the Cowichan River, at Riverbottom Road slide and Skutz Falls. The former occurred in an almost pure stand of grand fir in which 4 of 44 trees had stem attacks. The third area was near Green Lake north of Nanaimo.

Other Noteworthy Insects

Spruce tip moth, Zeiraphera sp.

Damage to shoreline Sitka spruce occurred at Long Beach and Port Renfrew in 1969. Over 90% of the buds on lower and mid-crown branches were damaged and this, along with the previous year's defoliation, gave branch tips an uneven appearance on the lower half of the crown. The first larvae were found in mid-May in flushing buds which were retaining their caps. Most buds developed, and defoliation, though heavy, killed few tips. Gale force winds and heavy rains removed discolored foliage and the trees appeared to suffer no ill effects from the defoliation.

Table 7. Other insects of current minor significance

Insect	Hosts ^{1/}	Locality	Remarks
<u>Adelges cooleyi</u> Cooley spruce gall aphid	sS, D	Widespread	Sucking insect. Prevalent on needles of Douglas-fir. Causes galls on the alternate host, spruce.
<u>Choristoneura occidentalis</u> Spruce budworm	wH, D	002, 021, 026	Defoliator. 8% of 168 collections averaged 1.8 larvae each.
<u>Dendroctonus pseudotsugae</u> Douglas-fir beetle	D	Marion Lake, 024	Bark beetle. Light population in predisposed mature Douglas-fir.
<u>Ectropis crepuscularia</u> Saddleback looper	wH, wC, D, aF	Widespread, heaviest in 025.	Defoliator. Found in association with green-striped forest looper in most infestation areas. 155 positive samples averaged 3.0 larvae each.
<u>Lambdina fiscellaria lugubrosa</u> Western hemlock looper	wH, D, wC, sS	Widespread	Defoliator; 7% of 429 collections averaged 1.4 larvae each. Slight increase from 1968.
<u>Mindarus abietinus</u> A balsam twig aphid	aF, gF	Widespread	Sucking insect. Heavy feeding, no significant damage.
<u>Neodiprion</u> spp. Sawflies	wH, D, sS, aF aLF, mH	All drainages	Defoliator; 121 positive collections averaged 18.5 larvae each. More than 300 larvae in a collection at McKay Cove.
<u>Neomyzaphis abietina</u> Spruce aphid	sS	Orveas Bay, Jordan River	Sucking insect. No signs of defoliation in 1969.
<u>Nyctobia limitaria</u> Green balsam looper	wH, D wC, sS	Quatsino region, Malksope, Little Espinosa, and Kashutl Inlets, Millar Channel.	Defoliator, 62 positive collections averaged 4.9 larvae each. Moderate increase from 1968

Table 7. (Continued)

Insect	Hosts ^{1/}	Locality	Remarks
<u>Orgyia</u> <u>pseudotsugata</u> Douglas-fir tussock-moth	D	Victoria	Defoliator. Single tree infestation causing heavy defoliation; 2,000 larvae collected.
<u>Pyrrhalta carbo</u> Pacific willow leaf beetle	W	Menzies Bay, Robertson River	Skeletonizer. Willow again attacked in Menzies Bay area. Up to 100% of leaves skeletonized on some trees.
<u>Steremnius carinatus</u> A seedling weevil	D	Davie River (Nimpkish Valley)	Feeding on stems of natural regeneration and planted seedlings. Five to 10% mortality.
<u>Stilpnotia salicis</u> Satin moth	silver poplar	Courtenay	Defoliator. Small localized infestation. Up to 80% defoliation on some trees. No mortality expected.
<u>Trypodendron</u> spp. Ambrosia beetles	D, wH, aF	Widespread, and west end Sproat Lake	Moderate activity in Taylor River fire area. Elsewhere light populations in windfalls, right of way logs and overwintered slash.

^{1/} Host tree abbreviations appear in the Appendix.

FOREST DISEASE CONDITIONS

The organisms currently causing much of the tree mortality, growth loss, and quality reduction attributed to diseases are mistletoes, and stem and root rot fungi. These organisms, once established in a stand, persist for many years. They usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may omit the mention of some of the more important diseases. Emphasis is placed on new outbreaks, the status of the annually varying foliage diseases and abnormal weather conditions, i.e., frosts, drought, snow damage, etc., which immediately affect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey, dealing with mortality, growth loss, and factors influencing the occurrence of the more important diseases, are summarized elsewhere.

Currently Important Diseases

Stem Disease

Dwarf mistletoe, Arceuthobium campylopodum f. tsugensis

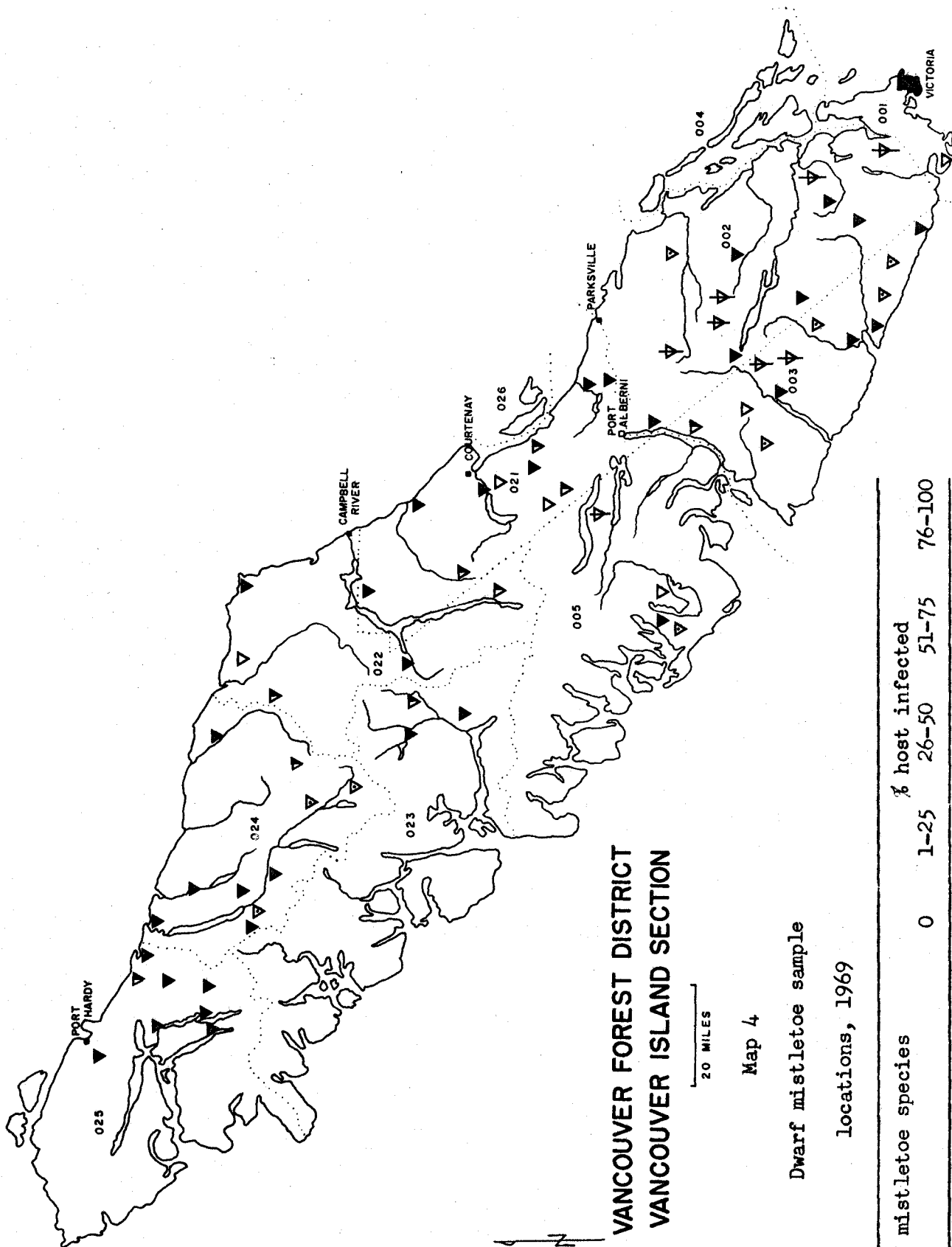
Fifty-tree examinations were made for dwarf mistletoe on western hemlock in each of 68 stands on Vancouver Island. Sixty of the stands were infected (Map 4). In 14 areas examined, 100% of the trees were infected and in 17 other areas over 80% were infected.

Dwarf mistletoe infection was widespread in hemlock and amabilis fir dominated stands, and non-continuous in mixed stands where Douglas-fir was the dominant species.

Non-infectious Diseases

Winter damage to western hemlock

Winter damage occurred to immature western hemlock on the steep side hill on the north side of Port Alice. Injury was probably caused by severe winter temperatures and exposure to the prevailing winds. The trees sustained a burnt appearance with much foliage loss. Incidence of browning was almost 100% in scattered areas. This damage occurred during the winter of 1968-69 and should not be confused with defoliation of hemlock by the green-striped forest looper in surrounding areas.



VANCOUVER FOREST DISTRICT
VANCOUVER ISLAND SECTION

Map 4

Dwarf mistletoe sample
locations, 1969

Dwarf mistletoe species	0	1-25	26-50	51-75	76-100
<u>Arceuthobium campylopodum</u>	▽	▽	▽	▽	▽
<u>f. tsugensis</u>					

Winter damage to Arbutus

Arbutus foliage was damaged by severe cold and high winds during the winter of 1968-69. Trees took on a distinct brownish appearance in February and March. Trees sheltered on the lee sides of islands, hills, etc., were not affected. By February, most of the exposed arbutus appeared to be severely damaged and it was suspected that heavy dieback and tree mortality would occur. In May, a close examination of several trees showed that damage was confined to the foliage and, in the odd case, the primary tissues of the branch-tips. In 26 examinations made throughout Victoria, Malahat, Metchosin, Sooke and Gulf Islands areas, an average of 10% of the buds were found to be killed. New foliage growth resumed in May and the trees gradually regained a normal appearance.

Exotic Plantations

There are 90 plantations of various introduced hardwood and softwood trees on Vancouver Island. Under a rotating system, normally one third of these are examined annually to determine the occurrence and effect of native insects and diseases on the various tree species.

Deformity and breakage of trees due to snow-pressure was a significant problem this year. Cluster pine in the Franklin River area was subject to breakage, and Scots pine near Campbell River to a lesser extent. European and hybrid larch in the Ash River region also suffered significant deformity. It is doubtful that many of these species will recover from the repeated bending and breakage that has occurred.

Red band needle disease caused by Scirrhia pini has infected Monterey, Bishop and Cluster pines since these plantations were established in 1957-1959. Most of the Monterey pines and about half of the Bishop pines have been killed. Cluster and Bishop pines were more heavily attacked by red band disease when in close proximity with Monterey pine and seemed immune or were lightly attacked when planted elsewhere.

Other Noteworthy Diseases

Poria root rot

Root rot caused by Poria weirii caused mortality of young Douglas-firs in groups over a 160-acre woodlot near Duncan. Except for a few old dead trees, most of the dead trees had been killed in the last few years. A number of living trees around the dead groups showed symptoms of infection by the disease.

Flood damage to Sitka spruce

Approximately 25 dying and dead Sitka spruce were seen on the valley bottom near Shushartie River mouth during aerial surveys. These trees appear to have died from flood damage that occurred when log jams caused the river to flood its banks during freshets and spread over flat terrain.

Exposure damage to broad-leaf maple

Noticeable browning and subsequent defoliation of broad-leaf maple occurred along the shore between Willow Point and Campbell River during mid-summer. Premature abscission was probably caused by salt spray from strong south-easterly winds. No mortality is expected.

Table 8. Other diseases of current minor significance

Organism	Hosts ^{1/}	Locality	Remarks
<u>Bacterium pseudotsugae</u>	D	Dunsmuir	Causing galls on stems and branches of understory trees. Common.
<u>Hendersonia pinicola</u>	1P	Horne Lake, Williams Beach, Comox	Needle blight, found in association with <u>Lophodermella concolor</u> .
<u>Lophodermella concolor</u>	1P	Horne Lake, Williams Beach, Comox	Needle cast, causing up to 80% defoliation of lodgepole pine over about 100 acres.
<u>Rhabdocline pseudotsugae</u>	D	Chemainus River, Kennedy Lake	Needle cast. Light attack on a few trees.
<u>Rhizina undulata</u>	D	Schoen Lake	Associated with root rot of Douglas-fir seedlings in burned areas. Light incidence.
<u>Virgella robusta</u>	aF	Father and Son Lake	Needle cast. Common in localized area of reproduction.

^{1/} Host tree abbreviations appear in the Appendix.

Appendix I. Host tree abbreviations

Abbr	Common name	Abbr	Common name
C	cedar-general	pP	ponderosa pine
wC	western red cedar	wwP	western white pine
yC	yellow cedar	S	spruce-general
D	Douglas-fir	sS	Sitka spruce
F	fir-general	Al	alder-general
alF	alpine fir	rAl	red alder
aF	amabilis fir	A or Po	aspen or poplar-general
gF	grand fir	tA	trembling aspen
H	hemlock-general	bCo	black cottonwood
mH	mountain hemlock	Ch	cherry-general
WH	western hemlock	M	maple-general
J	juniper-general	bM	broad leaf maple
L	larch-general	O	oak-general
P	pine-general	gO	Garry oak
lP	lodgepole pine	W	willow-general