

# PROVINCE OF BRITISH COLUMBIA

## FOREST DISEASE SURVEY

A. C. MOLNAR

Forest Biology Laboratory, Forest Pathology Unit, Victoria, B.C.

### INTRODUCTION

An intensive course in forest pathology given to the Forest Biology rangers in the spring of 1957 resulted in a marked increase in the quality of collections submitted during the field season. This observation is well supported by the list of "Other Noteworthy Diseases" presented at the end of this report. The fungi in this list now comprise new and important additions to the Victoria herbarium and in many cases represent diseases of present or potential economic importance. Many are causal agents of canker and dieback diseases which received particular attention in 1957.

There were no unusually severe disease outbreaks recorded in 1957. Foliage diseases, which are most subject to annual fluctuations, generally remained endemic. Although a few heavy infection centres were reported, they were confined to small areas. There were many reports of known damaging diseases such as the various mistletoes, Atropellis canker, and stem rusts. These added substantially to the distribution records of these important diseases. Reports of climatic injury were few and pertained to relatively light damage in all cases.

The Survey is again indebted to the Mycology Unit, Botany and Plant Pathology Division, for valuable help in identifying a large number of mycological specimens. Collections by co-operators continued to form a valuable part of the disease survey program.

During the 1957 field season a large number of fungi were isolated in culture particularly from dieback and canker diseases. A total of 2,715 collections were submitted to the Survey and are summarized by host as follows:

Coniferous trees	Collections	Coniferous trees	Collections
Douglas fir.....	915	Larch	
Fir—		Western.....	21
Alpine.....	323	European.....	4
Amabilis.....	203		25
Grand.....	25	Juniper, Rocky Mountain.....	7
	551	Yew, western.....	4
Hemlock, western.....	287	Total.....	2,422
Pine—		Broad-leaved trees	Collections
Western white.....	125	Alder.....	13
Ponderosa.....	85	Sitka.....	3
Lodgepole.....	29		16
	239	Aspen, trembling.....	15
Cedar—		Willow.....	13
Port Orford.....	125	Arbutus.....	9
Western red.....	15		
Yellow.....	3		
	143		

Coniferous trees	Collections	Broad-leaved trees	Collections
Cypress—		Birch, western white.....	8
Monterey.....	126	Cottonwood, black.....	7
Arizona.....	5	Ash, mountain.....	3
	131	Cherry.....	3
Spruce		Maple, broadleaf.....	2
White.....	101	Cascara.....	1
Sitka.....	12	Chestnut, horse.....	1
Engelmann.....	6		
Black.....	1	Total.....	78
	120	Miscellaneous or host not specified.....	215
		Grand Total.....	2,715

### IMPORTANT DISEASES

**The Fungi Associated with Post-felling Deterioration of Douglas Fir and Yellow Pine**—In 1956 a survey was carried out to determine the fungi associated with post-felling deterioration of Douglas fir and yellow pine in the Interior Region of British Columbia. Analyses were made in 21 localities of sample plots felled in 1953 by the Surveys Division of the British Columbia Forest Service. Cultural identification of the fungi involved have now been completed and the results are briefly summarized below.

Of the 20 fungi isolated from the two hosts, 17 occurred on Douglas fir and 12 on yellow pine. The fungi which occurred on 5 per cent or more of the trees sampled are presented by host in the following table.

Douglas fir (318 trees)	Percentage of trees infected	Yellow pine (180 trees)	Percentage of trees infected
Fungus		Fungus	
<i>Stereum sanguinolentum</i> A. & S. ex Fr.....	46.8	<i>Peniophora gigantea</i> (Fr.) Massee....	37.8
<i>Polyporus abietinus</i> Dicks. ex Fr.....	24.8	<i>Polyporus anceps</i> .....	31.7
<i>Fomes pinicola</i> (Sw.) Cke.....	17.6	<i>Stereum sanguinolentum</i> .....	18.9
<i>Polyporus anceps</i> Peck.....	15.4	<i>Polyporus abietinus</i> .....	12.2
<i>Stereum chailletii</i> (Pers. ex Fr.) Fr.....	14.8	<i>Peniophora phlebioides</i> .....	8.3
<i>Lenzites saeplaria</i> Wulf. ex Fr.....	13.8	<i>Lenzites saeplaria</i> .....	6.1
<i>Peniophora phlebioides</i> Jacks. & Deard.....	11.6		

A number of fungi were common to the two hosts as important agents of sapwood deterioration but their relative importance on the two trees was different. *Stereum chailletii* was common on Douglas fir but was not isolated from yellow pine. *Peniophora gigantea*, which was the most common sap rot fungus on yellow pine, occurred only on 4 per cent of the fir sampled. The trees sampled were on the same plots with the percentage distribution of the two species varying somewhat in the different plots.

**Inner Bark Stain and Cambial Necrosis Associated with Bark Beetle Galleries in Alpine Fir**—In a survey of bark beetle mortality in the McGillivray Lake region of the Kamloops Forest District only 35 per cent of recent mortality could be attributed directly to the activity of the bark beetle *Dryocoetes confusus* Sw. The remaining recently dead trees supported too few insects to account for their death. Furthermore the beetle attack in many such trees appeared incomplete. A tally of 1,821 alpine fir trees in five 1 x 40 chain strips showed 36.8 per



cent of the trees living, 59.0 per cent dead for more than two years, and the remaining 4.2 per cent recently dead. Of the latter group, beetle attacks accounted for less than half of the mortality. It was not possible to determine if the older dead trees had succumbed directly to beetle attack or if other agents were involved.

In order to account for the death of the lightly infested trees a more detailed examination was made to uncover other possible contributing agents. On shaving back the bark of lightly attacked recently dead trees, a light to dark-brown stain in the inner bark and underlying cambium was apparent. The staining was centered at beetle galleries and frequently coalesced with other similarly stained areas. Staining and actual lesion formation was more clearly evident in the cambium region where it was more restricted in extent and less confused with discoloration from normal drying of the bark. An examination of lightly attacked living trees revealed a similar but more distinctly defined staining and lesion formation in the cambium. In many cases staining had progressed to the point of girdling, indicating the imminent death of such trees. In all cases the staining was centred at beetle galleries.

Screening of a large number of cultures prepared from stained bark produced an unidentified fungus that was isolated from all stain samples and comprised 86 per cent of all isolates obtained. Identification and testing of this fungus are under way.

The problem is of particular interest because the beetle may serve as a vector for the fungus and even though the beetle attack may be unsuccessful, mortality can result from fungus infection which follows.

#### *Pullularia pullulans* Associated with Bud Necrosis in White Spruce

—Mortality of a high percentage of white spruce buds in an area of severe spruce budworm, *Choristoneura fumiferana* (Clem.), defoliation in the Babine Lake area of the Prince Rupert Forest District added to the heavy stress on already badly weakened trees. Examination of a large sample of buds revealed a slight necrosis at the tips of a large proportion of the buds. *Pullularia pullulans* (de Bary) Berkhout was isolated in agar culture from 95 per cent of the buds sampled. No other fungus was isolated. The 5 per cent which failed to yield *Pullularia* in culture was found to be free of necrosis. Further checks on bud development should be made in the spring and additional tests with the fungus are warranted.

**Diseases of Non-indigenous Trees**—An extension of a survey of exotic plantations, introduced as a regular function of disease survey in British Columbia in 1956, has raised the number of exotic plantations examined to 65 and increased the number of tree hosts under observation to 40. Establishment of sampling points and preparation of ecological descriptions for all plantation sites were completed during the year.

Examinations in 1957 confirmed earlier observations that competition from brush, animal browsing, and climatic injury comprise the most apparent hazards in the early life of plantations. As reported in 1956, only one plantation to date has reached a stage where disease fungi and insects have become an important factor in its development.

Two fungi recorded in the 1956 report are worth particular attention. *Tympanis laricis* (Fuckel) Sacc. was found associated with fusiform cankers of European larch on Vancouver Island. Damage up to the present has been light. This fungus, known in Europe and North America on native larches, has not been recorded previously as a parasitic fungus. A related species, *Tympanis confusa* Nyl., was found to cause severe cankering in red pine plantations out of the host's normal range in eastern United States.

A gall forming blister rust, *Peridermium* sp., probably the aecial stage of *Cronartium coleosporioides* Arth., caused branch and stem galls on Scots pines but little damage resulted in four plantations on Vancouver Island and the mainland. Should Scots pine offer no more resistance to this rust than native lodgepole pine during its later development, the disease might become a problem on introduced pines.

**Disease Conditions in Forest Nurseries**—Post-emergence losses were light in all forest nurseries except the Duncan Nursery where they were moderately high largely because of damping off and root rot. Experiments with some promising fungicides are still under way to try to reduce losses from pre-emergence damping-off which has partly accounted for inadequate emergence at all nurseries.

#### OTHER NOTEWORTHY DISEASES

(V.I.—Vancouver Island; Q.C.I.—Queen Charlotte Islands)

Host	Organism	Locality	Remarks
Alder, red. . . . .	<i>Belonidium parksii</i> Cash	Ucluelet, V.I.	On decorticated stems. First host record on alder and first record of occurrence beyond California.
	<i>Nectria pithoides</i> Ellis & Everh.	Lake Cowichan, V.I.	On bark of recently killed, young tree. First herbarium record.
	<i>Poria purpurea</i> (Fr.) Cke.	Langford, V.I.	Associated with a white rot of alder. First herbarium host record.
Alder, Sitka. . . . .	<i>Hypoxyton fuscum</i> (Pers.) Fr.	Giscome	Associated with dieback. First herbarium host record.
	<i>H. morsei</i> Berk. & Curt.	Giscome	Associated with dieback. First herbarium host record of fungus.
	<i>Rosellinia lignaria</i> (Grev.) Sacc.	Giscome	Associated with dieback. First herbarium record of fungus.
	<i>Tympanis alnea</i> (Pers.) Fr. var. <i>hysterioides</i> Rehm.	Saxon Lake	Associated with dieback. Probably first host record. See J. W. Groves, in Can. Jour. Bot. 30: 612-614, 1952.
Alder. . . . .	<i>Anthostoma microsporium</i> Karst. var. <i>exudans</i> Peck	Prince George	On dead stems. First herbarium record.
(Alder cont'd) . . . . .	<i>Valsaria moroides</i> (Cke. & Peck) Sacc.	Prince George	Associated with dieback. First herbarium record of genus.
Apple, Pacific crab. . . . .	<i>Gymnosporangium cornutum</i> Arth. ex Kern	Masset, Q.C.I.	Found near common juniper ( <i>Juniperus communis</i> ), the alternate host for this rust fungus. First record of the fungus occurring on apple ( <i>Malus</i> ).
Aspen, trembling	<i>Encoelia fascicularis</i> Kasrt.	Cache Creek	On dead bark. First herbarium record of the fungus.
	<i>Tympanis spermatispora</i> (Nyl.) Nyl.	Merritt	On dead bark. First herbarium record of the fungus.
Chestnut, horse.	<i>Nectria cinnabarina</i> (Tode) Fr.	Victoria, V.I.	Associated with canker and dieback of mature ornamentals. First herbarium record.
Conifers. . . . .	<i>Poria vaillantii</i> (DC.) Fr.	Victoria, V.I.	On lumber under moisture barrier of crawl space in house. First herbarium record.
Cottonwood, black. . . . .	<i>Cucurbitaria staphula</i> Dearn.	Quesnel	Associated with fusiform galls on living twigs. First herbarium record.
	<i>Linospora tetraspora</i> Thompson	Vancouver	Caused severe defoliation. First herbarium record of the pathogen.
	<i>Poria pannocinta</i> (Rom.) Lowe	Quesnel	Caused a white rot. First herbarium record.

<sup>1</sup> Complete lists of fungi collected in British Columbia and deposited at the herbarium in Victoria (DAVFP) are available from the Forest Biology Laboratory, Victoria, B.C.



## OTHER NOTEWORTHY DISEASES (Continued)

Host	Organism	Locality	Remarks
Cypress, Monterey.....	<i>Phomopsis</i> sp.	Victoria, V.I.	On frost-damaged branches of an ornamental. First herbarium host record and possible cause of dieback.
Elm.....	<i>Daedalea unicolor</i> Bull. ex Fr.	Agassiz	Capable of causing white rot and cankers of living trees. First herbarium host record.
Fir, alpine.....	<i>Retinocylus abietis</i> (Crouan) Grove & Wells	Prince George	Associated with canker and dieback of leader of living, immature tree. First herbarium record.
	<i>Rhizosphaera pini</i> (Cda.) Maubl.	Smithers	On dead needles. First herbarium record.
	<i>Scolecnectria balsamea</i> (Cke. & Peck) Seav.	Prince George	On dead bark of mature tree. First herbarium record.
Fir, Douglas....	<i>Lophium mytilinum</i> (Pers.) Fr.	Lake Cowichan, V.I.	Associated with <i>Dasyscyphus</i> sp. on wound cankers of 40-year old Douglas fir. First herbarium record.
	<i>Retinocylus abietis</i> (Crouan) Groves & Wells	Southbank	Associated with canker on living Douglas fir. First herbarium host record.
Fir, grand.....	<i>Fomes officinalis</i> (Vill. ex Fr.) Faull	Royal Oak, V.I.	Fruiting on trunk of old dead and down tree. First herbarium host record.
Fir, white.....	<i>Pucciniastrum epilobii</i> Otth.	Englewood, V.I.	Causing needle rust of seedlings in exotic plantation. First host record from B.C. Found to be locally epiphytotic on alpine fir in 1955 (Ann. Rept. For. Ins. Dis. Surv., p. 105, 1955).
Hemlock, western.....	<i>Cryptosporiopsis</i> sp.	Sooke, V.I.	Associated with hemlock dieback. "Looks like the conidial state of <i>Pezizula livida</i> (B. & Br.) Rehm" J. W. Groves. Cultured. First herbarium record.
	<i>Sporoschisma</i> sp.	Courtenay, V.I.	Associated with stem canker. "This may be a new species" J. W. Groves. First herbarium record.
	<i>Valsa abietis</i> Fr.	Courtenay, V.I.	On dead branches of living tree. First herbarium host record.
Holly, English...	<i>Trochila ilicis</i> (Chev.) Rehm	Victoria, V.I.	On shed leaves. "No previous N. American reports have been found". 36th Ann. Rept. Can. Pl. Dis. Surv. 1956, p. 119 (1957).
	<i>Ceuthospora phacidioides</i> Grev.	Victoria, V.I.	On shed leaves. First herbarium record.
Larch, European.	<i>Tympanis larinina</i> (Fuckel) Sacc.	Mesachie, V.I.	Found in exotic tree plantation, associated with stem canker. First herbarium host record.
Larch, western...	<i>Tympanis larinina</i> (Fuckel) Sacc.	Makinson Flats	Associated with fusiform branch canker. First herbarium record.
Maple, broadleaf.	<i>Melanconiopsis inquinans</i> Ellis and Everh.	Victoria, V.I.	Associated with <i>Tubercularia vulgaris</i> Tode, and stem-and-branch cankers of an ornamental tree. First herbarium record.
Maple, broadleaf.....	<i>Nectria cinnabarina</i> — (Tode) Fr.	Saanich, V.I.	Associated with branch cankers. First herbarium host record.
Oak, Garry.....	<i>Corticium leucoxanthum</i> Bres.	Victoria, V.I.	Associated with white rot of branches. First herbarium record.
Pine, ponderosa.	<i>Atropellis piniphila</i> (Weir) Lohm. and Cash	Echo Lake, V.I.	Associated with cankers and flagging in ponderosa pine plantation. New herbarium host record.
Pine, Scots.....	<i>Peridermium</i> sp.	Prince George	Galls on leader and branches of ornamental at Dominion Expt. Sta. Inoculated a possible alternative host ( <i>Castilleja</i> sp.) with negative results. Probably one of the gall rusts ( <i>Cronartium</i> spp.) native to B.C. The infected tree has been destroyed. See also Ann. Rept. For. Dis. Surv. 1956, p. 91.

## OTHER NOTEWORTHY DISEASES (Concluded)

Host	Organism	Locality	Remarks
Poplar, Lombardy....	<i>Stereum purpureum</i> (Pers. ex Fr.) Fr.	Victoria, V.I.	On living tree. First herbarium host record.
Spruce, Engelmann...	<i>Retinocylus abietis</i> (Crouan) Groves and Wells	Lumby	Associated with branch and stem cankers of living, immature trees. First herbarium host record.
Spruce, white...	<i>Fomes annosus</i> (Fr.) Cke.	Burns Lake	Causing root rot. First herbarium host record.
Spruce, white...	<i>Nectria cucurbitula</i> Sacc.	Prince George Crescent Spur	On stems of dead and down trees. First herbarium record.
	<i>Retinocylus abietis</i> (Crouan) Groves and Wells	Quesnel	Associated with fusiform twig cankers. First herbarium host record.
Spruce, Sitka....	<i>Meliola pinicola</i> Dearn.	Skidegate, Port Clements, Q.C.I.	A "sooty mold disease" on living needles of lower branches. First herbarium record.
Willow.....	<i>Cryptomyces maximus</i> (Fr.) Rehm	Manson Creek	Associated with stem and branch cankers of living, mature trees. First herbarium record.
	<i>Fomes igniarius</i> (L. ex Fr.) Kickx	Lake Cowichan, Campbell River, V.I.	Causing white heart rot of mature trees. First herbarium host record.
	<i>Melanomma pulvis-pyrius</i> (Pers.) Fuckel	Campbell River, V.I.	On stem of decorticated willow. First herbarium host record.
	<i>Nectria coccinea</i> (Pers.) Fr.	Lake Cowichan, V.I.	On recently killed shoot and associated with <i>Melanomma pulvis-pyrius</i> . First herbarium host record.
Yew, western....	<i>Sphaerulina taxicola</i> (Peck) Berl.	Kaslo	Associated with needle blight. First herbarium record.