ANNUAL REPORT

OF THE

VERNON FOREST INSECT LABORATORY

FOR THE FISCAL YEAR ENDING

MARCH 3 1 - 1937

Ralph Hopping

Entomologist.

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Geo. R. Hopping	-	Assistant Entomologist
W. G. Mathers	-	Junior Entomologist
H.A. Richmond	-	Junior Entomologist
H.B. Leech	-	Pest Investigator
Kenneth Graham	-	Pest Investigator
Miss Eleanor Eager	-	Stenographer#

Also stenographer for Mr. Buckell's Laboratory.

ANNUAL REPORT

of the

Vernon Forest Insect Laboratory - 1936-37.

Introduction.

Outbreaks of destructive forest insects have been at a low ebb during the past year in British Columbia with the exception of certain bark beetles in lodgepole pine. The coastal region has been particularly free and no extensive areas of defoliation of conifers have been reported from any section.

General Forest Insect Conditions.

Bark Beetles.

Two major outbreaks of bark beetles have occurred during the past several years. On one area in the Tatla Lake region, west of the Chilcotin, activity appears to have almost ceased, while on the other one in Kootenay National Park, the beetles are still active on limited areas.

Tatla Lake Area: - This outbreak was first reported by the forest ranger at Williams Lake in the summer of 1936. Examination was made by G. R. Hopping and H. A. Richmond during the latter part of August. Sixty to ninety

per cent of the lodgepole pine has been destroyed over hundreds of square miles on the east side of the Coast Range, between Tatla Lake and the Grand Trunk Railroade. The infestation, at least in the southern portion, has practically subsided. The timber is of rather poor quality and there are very few timber operations on the area. On this same reconnaissance, a small but active infestation was found on the Cariboo highway north of Clinton.

Kootenay Park Infestation: - This area, including old and new infestation, covers about 72 square miles. It occupies the full width of the valley from just south of McLeod Meadows, for a distance of twelve miles up river. Examination of the outbreak has been made for two years, and sample plots are being checked to determine the trend. Recommendations have been made to the National Parks Branch relative to the best way to handle the difficulty but no word has been received as to whether any work will be done in 1937.

The Douglas fir bark beetle (Dendroctonus pseudotsugae Hopk.) has not occurred in any intensive infestations over the past year. Attacks have occurred on small groups and individual trees throughout the entire Douglas fir region, causing considerable losses which are difficult to estimate.

A small outbreak of Pseudohylesinus granulatus Lec. was found in Abies grandis at Duncan. About 35 trees over several city blocks in the town were killed.

Defoliators

The European larch sawfly (Lygaeonematus erichsonii Hartig) in the Fernie region has decreased in numbers to such an extent that defoliation was scarcely noticeable during the 1936 season. This was due to a number of factors among which might be mentioned the fungus Isaria, mice and voles, the native parasites Coelopisthia Vnematicida Pack. and Bessa selecta and the introduced parasite Mesoleius tenthredinis Morley. The known range o f th. sawfly was extended forty-five miles to the westward. Egg scars were found on the east side of Kootenay Lake between Creston and Grey Creek.

There is some indication that several species of defoliators may be on the increase. During the past season a group of Douglas firs around a farm house near Salmon Arm were severely defoliated by Hemerocampa pseudotsugata McD. and some ornamental spruces in Salmon Arm were injured by Notolophus antiqua var. badia Hy. Edw. Infestations of H. pseudotsugata similar to the above have preceded wide-spread outbreaks in the past.

A douglas fir needle miner occurred in out-braak form in southern British Columbia near Laurier. This did not appear to be serious enough in 1936 to cause severe defoliation, although some trees were niticeably discoloured.

Quite severe defoliation of spruces occurred in places along the upper Kootenay River in the National Park, due to the feeding of a Nematine sawfly, probably Pachynematus ocreatus Marl. Tree mortality is very low as yet but the

infestation will bear watching.

The alder sawfly, Hemiclroa crocea Geoff. occurred in outbreak form in the lower Fraser Valley near Abbotsford. R. Glendenning found this sawfly defoliating cultivated filberts near Agassiz and it therefore is a potentially injurious pest of that host plant.

A general infestation of willows by the leaf beetle, Galerucella carbo Lec. occurred throughout the south eastern portion of Vancouver Island.

A heavy infestation of aphis on twelve to fourteen year old Douglas fir on Lot 87, Malahat district, caused severe defoliation but apparently no actual killing.

In Vancouver quite a few cases of fleas in fuel sawdust in homes have been investigated and control measures recommended. Numerous minor investigations have also been carried out dealing with insect pests of forest products.

Activities During 1937-38

The forest insect survey which has been in operation in eastern Canada will be extended to British Columbia during this and the following season. For 1937 the plan will include the Forest Service, National Parks Branch, and Forest Entomologists. The collectors of material will include all rangers, foremen of young mens' forestry camps, Parks wardens and entomologists. In 1938 it is planned to include private industry and to make the plan as complete as practicable.

Repellent studies in connection with ambrosia beetles will be continued at the Vancouver sub-laboratory and other problems arising in that region will be dealt with.

At the Trinity field station a study of the variations in the biology of Hemerocampa pseudotsugata McD. will be commenced. Other defoliators willbe included in the study as opportunity permits. Results will be checked with conditions in the open forest.

Re-checks will be made of the sample plots in Kootenay Park and any control work will be supervised by the Vernon Laboratory.

Plans have been submitted for the building of a permanent forest insect field station to be located at Trinity Valley, twenty miles from Vernon. The Provincial Forest Service has been asked to establish one of theyoung mens forestry camps near the area in order to clean up all of the debris, fall snags, and make it as fire proof as possible. Response from the Forest Branch has been favourable and the District Forester at Kamloops has been instructed to investigate the possibilities and make recommendations. Such a station will greatly facilitate the proposed forest insect survey and will enable research on forest insects when they are in an endemic state in the open forest.

Study of the larch sawfly and disemination of parasites will be continued at the Fernie Field station if the situation seems to warrant it. There is a possibility that enough Mesoleius may be available for shipment back to some

of the eastern larch sawfly areas as suggested by Dr. Baird, although it would be preferable to retain such material here and distribute it further westward between Creston and Grey Creek.

THE DOUGLAS FIR TUSSOCK MOTH

(Hemerocampa pseudotsugata McD.)

Eight or ten Douglas firs about the farm house of Major Armitage near Salmon Arm were severely infested during the summer of 1936. One of these trees will probably die. The occurrence of this infestation is of particular interest because similar small infestations about farm houses have preceded our previous heavy outbreaks in the forests. A preliminary study was made from material taken at the Armitage place. On the most severely infested tree cocoons were plastered beneath the limbs, on the trunk, and hung in festoons from the twigs.

Eggs.

It was found that the eggs could be readily separated by placing the egg mass in a 10% solution of KOH for a few minutes. They could then be readily counted and parasitized eggs were easily recognized by their dard colour in comparision to the china white of good eggs. The following table shows egg masses counted and parasitism in each. The parasite is Trichogramma minutum Riley.

Egg Mass	Good eggs	Parasitized	Total.
1	213	14	227
2	232	2	234
3	189	0	189
4	188	16	204
5	207	9	216
6	258	10	268
7	197	6	203
8	248	4	252
9	122	17	139
10	91	33	124
11	219	1	220
12	203	2	205
13	230	27	257
14	189	9	198
15	254	6	260
16	158	34	192
17	183	10	193
18	250	2	252
19	211	3	214
20	90	1	91
21	190	12	202
22	258	0	258
23	203	10	213
24	195	13	208
25	182	24	206
26	202	15	217
27	200	5	205
28	199	9	208
29	203	7	210
30	178	22	200
TOTALS	5942	323	6265

Summary.

Number of egg masses 30
" of good eggs. 5942
" of parasitized eggs 323
Total number of eggs 6265
Percentage of parasitism 5.15%
Average eggs per female. 208.8

Egg masses secured on November 9th were placed in vials in the laboratory. Adults of Trichogramma minutum emerged at intervals throughout the winter indicating that the emerging adults parasitized many of the good remaining eggs thus producing several generations. The rearing of Trichogramma in egg masses of the tussock moth is very easily done. Quite a number of caterpillars also emerged from the eggs during the latter part of November and in December.

A more comprehensive study of the Douglas fir tussock moth will be commenced this season using material secured from the Armitage place. Broods will be reared from segregated egg masses from which all parasites are excluded and fluctuations in biotic potential will be noted from year to year. Wherever material can be found similar studies will be made on this insect as it occurs in the open forest thus securing data on such factors as predators and parasites. In connection with this study it would be interesting to measure the percentage of ultra violet light present each day, in addition to the usual meteorological records.

per

DOUGLAS FIR NEEDLE MINER Contorinia sp.

This needle miner was first brought to our attention by Mr. Allen McAllum, who noticed it while on the smelter damage investigation in the vicinity of Northport, Washington. In 1936 it was prevalent between Northport and the boundary at Laurier and toward Grand Forks. In some places and on some trees it was thick enough to cause a reddish brown tinge to the foliage. An examination in the Vernon district (near Lumby) indicates that apparently the same species is present there but in much smaller numbers; not enough to cause visible browning of the foliage when viewed from a short distance.

There seems to be little preference as to position of the larvae in the needle, but current or second year needles seem to be preferred. On a very heavily infested twig there were 56 needles containing larvae and 23 uninfested. At the time of examination (September 17th) larvae were about full grown.

Oviposition punctures appear as dark brown spots on the lighter brown of the affects portions of the needle. It is possible to tell the approximate position of a larva in a needle by the texture of the needle. The larva excavates a chamber, usually to one side of the mid-rib and the overlying surface is usually a little lighter in colour and pliable in contrast to the firmness of surrounding tissue.

Number of Larvae per Needle.

1 - 4	11 - 0 (larva died?)	21 - 3	31 - 1
2 - 3	12 - 0 (larva died?)	22 - 2	32 - 1
3 - 1	13 - 1	23 - 2	33 - 2
4 - 8	14 - 0 (larva died?)	24 - 3	34 - 3
5 - 9	15 - 0 (larva died?)	25 - 2	35 - 1
6 - 5	16 - 1	26 - 3	36 - 7
7 - 2	17 - 5	26 - 1	37 - 1
8 - 1	18 - 2	28 - 2	38 - 0
9 - 1	19 - 1	29 - 4	39 - 1
10 - 1	20 - 1	30 - 0	40 - 1

Average number of larvae per needle - 2.15
Greatest number of larvae in one needle - 9

An attempt was made to keep material over winter but the foliage became too dry and the larvae died. Fresh material will be secured in the spring of 1937 and more of the life history of this needle miner ascertained. Adults will be submitted to Ottawa for identification.

G. R. Hopping,

SMELTER DAMAGE

In connection with the Trail Smelter damage, Ralph Hopping and Geo. R. Hopping inspected sample plots in the vicinity of Northport, Washington, September 13th to 16th - 1936. In the company of Mr. Allen MacAllum, twelve plots were examined to check the number and condition of trees on the plots in order to compare with previous inspections. The plots were established in 1930.

Plot 21: - Situated on east side of the river, 3½ miles from the border in the United States. There are 20 living yellow pines and 8 living lodgepole pines, 28 living trees. This is the same as in 1934. The trees are in a fairly vigorous condition considering the site.

Plot 22: - Situated on the east side of the river 2 miles from the border in the United States. All trees are yellow pines - 8 living, 2 dead. One live tree was unaccounted for. There were five standing dead trees in 1934.

Plot 7: - This is one of the plots established by Dr. Hedgcock on the west side of the river between Northport and the border. There are 62 living trees and 2 standing dead ones. The 4th stake on this plot was not located.

Plot 11: - Situated on the west side of the river between Northport and the border. There are 44 living trees, a few showing winter injury. There are two standing stubs. There were three dead in 1934. None have died since 1934.

Plot 12: - Situated near the old Velvet school house on the Northport - Rossland road. There are 36 Douglas firs in thrifty condition, 3 in fair condition, and 2 poor. The 2 poor ones and one of the fair ones are suppressed. No trees have died since 1934.

Plot 15: - Situated down river on the west side about 3 miles from Northport. The trees are all yellow pine, 13 thrifty, 1 fair and 1 poor. No trees have died since 1934.

Plot 9: - Situated near the river on the west side about 5 miles below Northport. The plot is on an elevated piece of ground which becomes an island during high water. There are 49 thrifty yellow pines on this plot, 8 fair, and 1 poor. This is 4 trees in excess of the 1934 count and three more than the 1930 count, probably due to a few trees along the line which were included in 1936 and not in the previous counts. No trees have died since 1934.

Plot 14:- Several miles further down river from Plot 9. All trees are yellow pine. There are 55 thrifty, 5 fair, and 4 poor. No trees have died since 1934. In 1930 there were 67 living trees. The three that died were small and fire scarred. One was attacked by secondary insects.

Plot 3: - Situated above road, down river from Northport on the east side. There are 51 thrifty yellow pine, 52 in 1930. The dead one was a small tree about 4 feet high. No cause of death could be found.

Plot 4: - Situated down river on east side. There are 69

thrifty yellow pines and 3 poor due to suppression.

Plot 19: - Situated down river on east side near Marble. There are 36 thrifty yellow pines, 5 fair and 7 poor. There are 3 dead standing trees, 3 were cut in 1936 and 1 died due to a fire scar followed by insects. All poor and fair trees owe their condition to suppression.

Plot 5: - Down river on west side just north of Bossburg. There are 12 dead standing trees but not recently killed. Poor trees and most of the fair trees owe their condition to suppression, and fire scars.

Owing to the fact that smelter damage is still a serious problem in the Northport area, it is quite probable that officers of the Vernon laboratory will be requested to make periodic checks of these plots in the future. Some of the plots established in 1930 could not be located definitely in 1936 owing to the destruction of some or all of the marking stakes.

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REPORT OF THE VANCOUVER
SUB-LABORATORY.

- 1936 -

W. G. Mathers,
Junior Entomologist,
in charge.

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REPORT OF THE VANCOUVER
SUB-LABORATORY.
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INTRODUCTION.

As the coast district of British Columbia experienced in 1936 another year free of any major outbreak of forest insects, the principal project of this Laboratory during the past year has been the continuation of the investigation of repellents as a possible means of preventing ambrosia beetle attack on green logs. However, the work of the Laboratory also included, the investigation of various minor problems, the inspection of reported insect damage to shade and forest trees, and the replying to numerous inquiries with regards to insect pests. The outgoing mail during the year amounted to 19 packages and 155 letters, all of which were handled without the aid of a stenographer.

A paper on "Notes on Halisidota argentata Packard" was presented by the writer at the annual meeting of the Entomological Society of British Columbia held in Vancouver, B. C. on February 29 and on March 17 a talk on "Insects in Relation to Forestry" was delivered to the Forest Club of the University of British Columbia. Moreover, on March 20 a lecture on "Insects in Relation to Lumber" was delivered to the class of a short course in dry kilning given by the Dominion Forest

Products Laboratory at Vancouver, B. C.

The Laboratory was visited by Mr. Geo. R. Hopping, Assistant Forest Entomologist, in the first part of June and by Mr. Ralph Hopping, Forest Entomologist, in October. The purpose of these visits was to confer with the writer on the work of this Laboratory and to inspect its various activities.

The weather this year in the coast district of British Columbia was characterized by a very mild January, an extreme cold spell in February followed by a late spring with wet cool weather extending until well into July. Following this, however, no measurable precipitation occurred in Vancouver until the end of August and the fall was exceptionally mild with the first frost of the season not being recorded until November 1.

Inspections.

In addition to various inspections of insect damage to local forest and shade trees, two inspection trips were made to Vancouver Island during the year. The first of these was from May 25 to 29, when several minor outbreaks were investigated and a visit made to the Provincial Forest Experiment Station at Cowichan Lake where insect conditions were examined and discussed with the officers in charge. On the same trip the opportunity was also taken for a discussion of our problems with Mr. Orchard, Assistant Chief of the Provincial Forest Service, and for a visit to the Dominion Entomological Laboratory at Victoria, B. C., where Mr. W. Downes explained the technique they are using for the rearing of parasites of the European earwig. The second trip to Vancouver Island was

made from August 12 to 14, the chief purpose of which was to check on the insect conditions at the Cowichan Lake Forest Experiment Station.

An inspection trip was also made on November 2 to the head of the North Arm of Burrard Inlet for the purpose of examining the site of the western hemlock looper outbreak of 1928-1929, but owing to the neglected condition of the trail and the limited time available between the arrival and departure of the boat, the sample plot was not visited. A general view of the area gave the impression that the timber stand was in healthy condition and that comparatively little damage had resulted from the infestation. However, a closer examination revealed a number of dead trees and numerous stag-headed trees scattered throughout the area.

A check has been kept on the clean-up work being done in Stanley Park by the City of Vancouver. (See Figures 1, 2, & 3). This work, which includes the removal of dead and dying standing timber and recently downed trees, has progressed very satisfactorily from both the practical and entomological viewpoints, although a portion of the uninformed public have complained of the seemingly destruction of the park.

Co-operation.

Co-operation of a very staisfactory nature has been maintained between this laboratory and the University of British Columbia, the Provincial Forest Service and the Dominion Forest Products Laboratory at Vancouver, and we are very pleased to again acknowledge our indebtedness to the

University for the continued use of Room D in the Agriculture Building as an office and laboratory. Moreover, the telephone connection which was extended to the room in October by the University has been very much appreciated. In the absence of Professor Spencer during the summer months, we have been only too pleased to assist in replying to inquiries received by the University with regards to household and garden insects. The permission granted by the University's Department of Forestry to use its forest for our work and the providing of space for our portable cages by the Dominion Forest Products Laboratory are also gratefully acknowledged.

Personnel.

The writer, W. G. Mathers, Junior Entomologist, has been in charge of the laboratory throughout the year and with assistance limited to that of Mr. K. Graham, Insect Pest Investigator, for the period from May 6 to June 3.

FOREST INSECT CONDITIONS DURING 1936.

Defoliators.

No report of the occurrence of any of the following important defoliators were received nor were their presence noticed during the year:

Western Hemlock Looper - Ellopia somniaria Hulst.
Black Headed Budworm - Peronea variana Fern.
Green Hemlock Looper - Nepytia phantasmaria Stkr.
Pine Butterfly - Neophasia menapia Feld.

Spruce Budworm - Cacoecia fumiferana Clem.

No reports were received of the spruce budworm but as in the previous two years a few specimens were to be found on trees in the Botanical Garden of the University. The hosts included Engelmann spruce, sitka spruce, Douglas fir and lodgepole pine.

Douglas Fir Webworm - Halisidota argentata Pack.

No outbreak of this defoliator was reported but a colony of over 120 young caterpillars taken on Douglas fir near Victoria, B. C. was received on March 18 from Mr. W. Downes.

Satin Moth - Stilpontia salicis L.

The satin moth was in evidence very little this year. A few caterpillars were recovered from a willow tree in the University's Botanical Garden and the poplars on the campus were only lightly infested.

Tent Caterpillars - Malacosoma sp.

Mr. W. Downes reported the tent caterpillar, M. pluvialis Dyar, to be epidemic at Victoria, B. C., but was of the opinion that 1936 was the peak year of the infestation. The outbreak

was apparently confined to Victoria and its immediate vicinity. Although a serious tent caterpillar outbreak was expected at Pemberton Meadows this year no report was received from that district.

Willow Leaf Beetle - Galerucella carbo Lec.

An extensive outbreak of this species occurred this year on the native willow throughout the south-eastern portion of Vancouver Island. Adults were taken by the writer on August 14 at Cowichan Lake.

Alder Sawfly - Hemichroa crocea Geoff.

A general outbreak of the alder sawfly occurred this year in the lower Fraser Valley, being particularly in evidence in the vicinity of Abbotsford, B. C. A small outbreak was also found in second growth alder on the sub-division of the University of British Columbia. A number of trees were completely stripped of their foliage.

Bark Beetles.

No serious outbreak of bark beetles was reported or encountered during the year but the following minor infestations occurred:

Dendroctonus pseudotsugae Hopk.

A report of insect damage to standing Douglas fir timber on a logging operation near White Rock, B. C. proved on examination on September 3 to be the work of this species. About a dozen trees on the edge of an area burnt over in the spring were found to be infested. Fresh attacks by this species were also found on May 12 on Douglas fir logs in Stanley Park.

Dendroctonus obesus Mannh.

On July 14 two dying sitka spruce trees growing on the bank of the Alouette River in the Maple Ridge Park were found to have been attacked by this bark beetle.

Pseudohylesinus granulatus Lec.

A small infestation, presumably of this species working with Scolytus ventralis Lec., was found on May 26 in the town of Duncan, B. C. About 35 trees, Abies grandis, over an area of several city blocks were killed last year. The trees averaged about 12 inches in diameter. (See Figures 5 and 6)

Pseudohylesinus nebulosus Lec.

Several second growth Douglas fir reported dying on private property near West Bay, West Vancouver, B. C., proved on examination on July 22 to have been attacked by this bark beetle. Several trees on the same area had also been killed in 1935.

This species and Scolytus unispinosus Lec. were also found attacking scattered second growth Douglas fir at the Provincial Forest Experiment Station at Cowichan Lake, B. C. and on other areas in the same districts. However, these attacks were of a secondary nature as the trees showed a definite loss of vitality previous to the attacks. Although the weakened condition of some of the trees had been due to aphid attack, with others the primary cause has not been ascertained.

Phlecosinus punctatus Lec.

Two trees in a group of six native western red cedar on private property in the Kerrisdale district, Vancouver, were

found on June 3 to be dying as a result of attacks by this bark beetle. The trees varied from 6 to 8 inches in diameter and had been retained for their aesthetical value.

Wood Borers.

Ambrosia Beetles attacking Conifers.

The ambrosia beetles, Gnathotrichus sulcatus Lec., Trypodendron cavifrons Mannh., Xyleborinus tsugae Sw. and Platypus wilsoni Sw., have continued to be a serious menace to freshly felled logs in this district and our investigation of this problem is being continued.

Western Cedar Borer - Trachykele blondeli Mars.

Several requests for information on the western cedar borer were received during the year. In May the Line Department of the British Columbia Electric Power and Gas Company received a shipment of poles from near Stave Falls, B. C. and 15 out of 100 poles showed evidence of this borer. However, the poles were of low grade with numerous knots. A shipment of clear poles received at about the same time from the Campbell River district proved to be all sound.

Samples of fresh cedar shingles received on June 1 from a local cedar lumber and shingle mill showed the work of very young cedar borer larvae. The original logs were from the Powell Lake district but the damage was not extensive.

Insect Attacking Forest Products.

On August 7 the foundations timbers of a house in New Westminster, B. C., were found to be so weakened by insect damage that considerable replacement work was necessary. The

infested material consisted of untreated wood in direct contact with the soil. Both Termites and an Anobiid, Coelostethus quadrulus Lec., were responsible for the damage. (See Figures 7 and 8).

Termites were also recovered in July from the butts of telephone poles being replaced on West 10th Avenue, Vancouver, and on September 20 winged termites emerging after dark from beneath the flooring of a house in Mission, B. C. were being attracted to electric lights.

On May 28 carpenter ants were found to be infesting the base of the frame of an outside door in one of the University's buildings. The infested wood also showed considerable dry rot. This year, carpenter ants were in flight in Vancouver and vicinity from May 10 to 12.

A sample of wicker furniture submitted to the Laboratory on May 21 was found to be infested with a beetle tentatively identified by Mr. Ralph Hopping as Habrobregma gibbicollis Lec.

Other wood borers recovered during the year were:- Xylobiops basillare Say. from hickory imported from the south eastern States by a local ski factory; Tarostenus univittatus Rossi; and Lyctus planicollis Lec. infesting lowland white oak planking received by a local importer from Tenessee, and a Lyctus species from a sample of gumwood imported by the same company from Australia. (See Figures 9, 10, 11, and 12)

Miscellaneous Insects.

Desmocerus cribipennis Horn.

A report received May 23 of insect injury to a variegated

elder in Vancouver was found on investigation to be the work of this elder borer and at that time the adult beetles were emerging from the infested stems.

Anisandrus pyri Peck.

In June the superintendent of the Provincial Green Timbers Forest Experiment Station submitted specimens of Anisandrus pyri which he had found attacking and killing Weigelia at the Station earlier in the year. Samples of walnut twigs received at the Laboratory from Ladysmith, B. C. in October were found to be infested by the same beetle.

Coptodisca arbutiella Busck.

Several arbutus on the campus of the University were found this year to be again fairly heavily infested with this leaf miner and also by a microlepidoptera which has been identified by Dr. J. McDunnough as a species of Epinotia.

Cenerostoma piniariella Zeller.

In 1935 a small leaf mining lepidoptera was found to be infesting a white pine, Pinus monticola, in the Botanical Garden of the University. The species which was again active this year has been since identified as the European pine leaf miner, Cenerostoma piniariella Zeller. Mr. Busck of the United States National Museum who made the determination has informed Dr. McDunnough that the species was reported from British Columbia in 1922.

Aphids on Conifers.

An infestation in Douglas fir on Lot 87, Malahat district, Vancouver Island, which had been reported early in the year by

the Forest Ranger at Duncan was examined on May 26. The infestation occurred in an excellent stand of 12-14 year-old trees over an area of about 200 acres and was found to be the work of an aphid, presumably Adelegas cooleyi Gill. Last year's needles on the majority of the trees were badly discoloured while in severe cases such needles had dropped during the winter. The trees were again infested this year and similar but lighter infestations were to be found at various points between Nanaimo and Victoria, B. C. A number of Douglas fir Christmas trees on the Vancouver market this year also showed evidence of attack by this aphis.

A heavy infestation of the spruce gall aphis, A. cooleyi, on young sitka spruce which had recently been set out on a local golf course was also reported on October 14, and the sitka spruce in the Botanical Garden of the University was this year again heavily infested with the same species. This latter tree had been heavily infested with A. cooleyi in 1934 but last year had only a few galls of A. coloradensis on it. This would suggest only a two year cycle for the former species on spruce.

The hemlock woolly aphis was also found this year to be fairly general on hemlocks in Vancouver and district and in September a balsam tree on private property in Vancouver was found to be infested with an undetermined species of Chermes.

Fleas in Sawdust.

Four reports of the occurrence of fleas in fuel sawdust stored in private residences in Vancouver were received in the

fall of the year. In each case a dog had had access to the basement where the sawdust was stored. However, actual specimens of the fleas were only obtainable from two of the houses, but in each of these cases the specimens proved to be the common dog flea. An additional request for information on the control of fleas in sawdust was also received but details of their occurrence were not forthcoming.

MAJOR PROJECT

INVESTIGATION OF AMBROSIA BEETLES.

This year the investigation of ambrosia beetles attacking green western hemlock logs was confined mainly to the study of repellents as a means of preventing attack. However, general observations on the life histories and habits of the beetles were recorded and additional determinations were also made of the moisture content of the sapwood in relation to time of attack.

Notes on Life Histories and Habits.

Trypodendron cavifrons Mannh.

Fresh attacks by Trypodendron were not observed in Stanley Park this year until April 23, fully three weeks later than in 1935, while emergence from caged material did not occur until April 30. Although on April 24 fresh Trypodendron attacks were found on Timber Berth X on hemlocks felled the previous fall, attacks on the logs of the repellent studies were not recorded until July 14. On this latter date a number of Trypodendron were to be observed in flight.

Gnathotrichus sulcatus Lec.

The first Gnathotrichus attack on the logs of the repellent studies was recorded on May 14, but comparatively heavy attacks did not occur until June. However, attacks by this species continued throughout the summer and on until very late in the fall, 27 new attacks being recorded even after November 3. (See Table II) In our previous investigations of ambrosia beetles

no fresh attacks have been recorded after the end of September and the continued activity of the beetles this year can only be explained by the prolonged mild weather experienced in the district this fall. The first frost of the season was not recorded until November 1. The fact that 11 of the new attacks recorded after November 3 were on a single log belie the possibility that such attacks had been overlooked during the previous examination of the logs. Moreover, the continued activity of the beetles was indicated by the occurrence of fresh frass on the logs and the presence of a live Gnathotrichus adult on the bark surface of one of the logs on November 24.

Xyleborinus tsugae Sw.

A very marked Xyleborinus attack occurred on the logs of the repellent studies this year after the middle of June, heavy attacks by this species being recorded on June 26 on Logs No's 1, 6, 8 and 15.

Platypus wilsoni Sw.

A number of fresh Platypus attacks were found on August 5 on a hemlock log at Green Timbers, but the attacks by this species on the logs of the repellent studies on Timber Berth X were limited to a single attack which was recorded on August 20 on Log No. 1.

Repellent Studies.

The investigation of repellents for ambrosia beetles attacking green logs which was undertaken in 1935 on an area near the Green Timbers Forest Experiment Station, was continued this year at the site of a logging operation on Timber Berth X

about 3 miles north of Whonnock, B. C. The change in location was necessitated by the fact that logs were no longer available at the Green Timbers as the logging operation there had been completed. However, the site on Timber Berth X proved much more satisfactory as the logging operation was on a much larger scale and a very much denser ambrosia beetle population was present on the area.

The hemlocks required for the experiments this year were very generously donated by the operator on Timber Berth X, Mr. P. Bain of Whonnock, B. C. Two trees of about 17 and 19 inches D.B.H. were used, these being felled and sawn by the writer into a total of 15 ten-foot logs. The first tree was felled on March 23 and the second on April 24. The logs were rolled into parallel positions on a small clearing, with the ends approximately east and west and protected by partial shade. The bark for the most part remained intact on each log. (See Figures 13 and 14) Details of the logs are given in the following table:

Details of Logs of Repellent Studies - 1936.

Log No.	Length	Diameter inside Bark Butt	Top	Direction of Top
1.	10'	18.0"	17.0"	East
2.	10'	17.0"	16.0"	"
3.	10'	20.0"	18.0"	"
4.	10'	13.0"	11.0"	"
5.	10'	11.0"	10.0"	"
6.	10'	15.0"	14.0"	West
7.	10'	14.0"	13.0"	"
8.	10'	16.0"	15.0"	"
9.	10'	11.0"	10.0"	"
10.	10'	12.0"	11.0"	"
11.	10'	13.5"	12.0"	"
12.	10'	14.0"	12.5"	"
13.	10'	15.0"	14.0"	East
14.	10'	15.5"	15.0"	West
15.	10'	17.0"	15.5"	

The first eight logs in the series were from the first tree, felled March 26, with log No. 3 the butt log and the others in the following order from the butt, No's. 1, 2, 8, 6, 7, 4 and 5, the top log. The remaining logs were from the second tree, felled April 24, and are in consecutive order with No. 9 the top log and No. 15 the butt log.

Based chiefly on the results obtained in 1935, the following solutions were selected for trial this year:

(a) Creosote (refined), 1 part
Kerosene, 3 parts.

(b) Lime-sulphur concentrate, 1 part
4% miscible oil solution, 1 part

(c) 1:8 lime-sulphur solution containing a spreader.

(d) 1:8 lime-sulphur solution, 98%
Miscible oil, 2%.

(e) Dr. Porter's colloidal solution.

(f) 4-6-32 Bordeaux mixture, 80%
Miscible oil, 20%

(g) 4-6-36 Bordeaux mixture containing a spreader.

(h) 4-6-36 Bordeaux mixture, 98%
Miscible oil, 2%.

(i) Waste sulphite solution containing a spreader.

(j) Waste sulphite solution, 98%
Miscible oil, 2%.

(k) Colloidal lead arsenate, 2 lbs. to 1 gallon of water.

Details of the chemicals used are as follows:

Lime-sulphur concentrate: 30 - 32° Baume at 60° F.

Total sulphur in soluble sulphides 24.47%.

Miscible oil: contains .25% true carbolic acid.

Waste sulphite solution: obtained from the Powell River Pulp and Paper Co., Powell River, B. C.

Dr. Porter's colloidal solution: an experimental spray preparation of Dr. J. A. P. Porter, Consulting Research Chemist, Vancouver, B. C., and suggested by him for trial.

Spreader: a product of Dr. Porter.

Colloidal L.A.: a lead arsenate solution producted by the Lunevale Products Ltd., England, and suggested for trial by a representative of the local agents, Buckerfield's Ltd., Vancouver, B. C.

All the solutions except the colloidal lead arsenate were applied to the logs on May 6 and before any ambrosia beetle attacks had occurred on the logs. The last solution was applied on June 19 to log no. 14 which at that time was still uninfested. A small bucket pump sprayer was employed for applying the solutions and from 1 to 1½ gallons of each spray was used. The treatment received by each log was as follows:

Log No.	1 - Sprayed with solution	(a)
" "	2 - " " "	(b)
" "	3 - Used as a check.	
" "	4 - Sprayed with solution	(c)
" "	5 - " " "	(d)
" "	6 - " " "	(e)
" "	7 - " " "	(f)
" "	8 - " " "	(h)
" "	9 - Used as a check.	
" "	10 - Sprayed with solution	(g)
" "	11 - " " "	(i)
" "	12 - " " "	(j)
" "	13 - Used as a check.	
" "	14 - Sprayed with solution	(k)
" "	15 - Used as a check.	

Following the applications of the sprays observations for ambrosia beetle attacks were made at approximately weekly intervals until the end of August, following which the observations were less frequent. As the presence of fresh frass

was used as an indication of attacks, satisfactory records could not be obtained in the rain. As each new entrance hole was observed it was marked with red pencil. A summary of the attacks is given in Table II.

From the record of attacks on the logs as summarized in this table, it is evident that the possibility is quite remote of finding a repellent which with one application, would be effective throughout the season. However, more satisfactory results might be obtained with two or more applications of some of the more promising solutions. With this possibility in view, the investigation will be continued at least another year, the first application being made at the beginning of the season and a second a month later or at the first indication of ambrosia beetle attack. Mr. Bain has already granted us permission to continue the studies on the same area.

Moisture Content of Sapwood of Logs.

Determinations were made of the moisture content of the sapwood of the logs used in the repellent studies this year in order to supplement the data secured in our previous studies of the relation of the moisture content of the sapwood attack by ambrosia beetles. Two sets of determinations were made, the first from samples taken on September 29 from the upper half of the north side of the logs and the second set from samples taken on November 24 from the same realtive position on the south side of the logs. All the samples were taken midway along the logs and trimmed to a depth of one inch.

TABLE II.

SHOWING AMBROSIA BEETLE ATTACKS ON LOGS OF REPELLENT STUDIES, 1936.

LOG NO.	SPRAY	MAY 14	MAY 21	JUNE 1	JUNE 12	JUNE 19	JUNE 26	JULY 3	JULY 14	JULY 23	AUG. 3	AUG. 10	AUG. 20	SEPT. 4	SEPT. 20	SEPT. 29	OCT. 9	OCT. 21	NOV. 3	NOV. 24	TOTAL
1	Creosote-kerosene	-	-	-	4	12	49	15	19	4	20	9	5	12	10	-	1	9	2	1	172
2	L.S. conc. & 4% oil	-	2	1	1	-	4	2	38	42	7	10	14	9	3	3	5	14	3	1	159
3	Check	-	-	-	-	-	-	-	-	1	-	3	8	67	74	36	8	18	6	5	226
4	L.S. 1-8 & spreader	-	1	-	-	-	-	-	-	1	-	1	4	3	21	11	24	18	5	11	100
5	" " " oil 2%	-	-	-	1	-	1	-	1	2	18	3	12	31	27	3	-	4	2	-	105
6	Porter's Coll.Soln.	-	4	2	12	7	21	31	103	81	40	25	18	16	4	1	-	1	-	-	366
7	Bordeaux mix. emul.	1	2	7	13	2	7	6	8	8	3	6	2	1	2	7	3	2	1	3	84
8	" " & oil 2%	-	4	8	28	20	60	86	136	44	35	35	13	16	7	-	-	1	1	-	494
9	Check	-	-	-	1	1	-	5	10	2	5	1	1	4	1	1	-	3	-	1	36
10	Bord. mix. & spdr.	-	1	1	-	1	-	1	3	3	1	-	2	-	1	-	3	11	2	1	31
11	W. Sulphite & spdr.	-	-	-	1	-	-	1	2	1	1	3	1	5	2	2	13	31	1	2	66
12	" " & oil 2%	-	1	-	-	-	-	-	-	-	-	-	4	5	5	16	30	46	3	-	110
13	Check	-	-	-	-	-	2	4	10	1	5	6	1	5	7	-	-	8	1	1	51
14	Colloidal L.A.	-	-	-	-	-	-	11	35	4	4	4	11	5	4	-	-	7	-	1	86
15	Check	-	-	-	8	8	29	23	100	31	18	14	11	17	18	-	-	-	-	-	277
	TOTALS:	1	15	19	69	51	173	185	465	225	157	120	107	196	186	80	87	173	27	27	2363

Their moisture content, expressed in percentage of dry weight are given in the following table:-

TABLE III.

Repellent Studies - 1936

Moisture Content Determinations

Log No.	Treatment	Moisture Contents Sept. 29	Nov. 24	Density of attack
1.	Creosote-kerosene	110%	111%	Medium
2.	Lime-sul. conc. & 4% oil	97%	141%	"
3.	Check	84%	102%	Heavy
4.	Lime-sul. 1:8 & spreader	168%	138%	Medium
5.	" " & oil, 2%	144%	116%	"
6.	Porter's colloidal soln.	160%	171%	Very heavy
7.	Bordeaux mix. emulsion	159%	116%	Medium
8.	" " & oil, 2%	145%	137%	Heavy
9.	Check	158%	142%	Light
10.	Bordeaux mix. & spreader	160%	150%	"
11.	Waste sulphite & spreader	152%	152%	Medium
12.	" " & oil, 2%	162%	134%	"
13.	Check	138%	127%	Light
14.	Colloidal lead arsenate	137%	143%	Medium
15.	Check	106%	93%	Heavy

Although the sample taken on September 29 from Log No. 3, a butt log, showed only 84%, the moisture content of the same sample to a depth of ½ inch was 98%, and the second sample taken on November 24 from the same log showed 102%. Hence, including this log, the above figures support the conclusion previously reached in these studies, namely that a sapwood moisture content of not less than 90% is necessary for ambrosia beetle attack.

MINOR PROJECTS.

DOUGLAS FIR WEBWORM - Halisidota argentata Pack.

General Observations.

A large colony of young active caterpillars of the Douglas fir webworm received on March 18 from Mr. W. Downes of Victoria, B.C. provided material for additional observations this year on the bionomics of the species. The colony consisted of about 125 specimens, averaging over 10 mm. in length and feeding on Douglas fir. Ten of the caterpillars were immediately preserved while the balance were transferred to a potted Douglas fir transplant contained in a portable cage under field conditions (See Figure 4). At intervals during the remainder of the larval period a total of 35 specimens were removed and preserved in lots of five. An additional 45 caterpillars were transferred on April 11 to a set of three cages containing the same host plants for an experiment with sodium selenate.

By May 30 the majority of the specimens in the cages had formed cocoons in forest floor debris provided for them in the bottom of the cages. The first Halisidota moths were taken in the original cage on July 16 and the emergence in this cage continued until July 31 with a total of 22 male moths and 17 female moths being recovered. Although pupation was completed in the sodium selenate cages by May 30 the emergence of moths did not commence until July 20. In all 30 moths were taken in these cages, but of these only 8 were females, whereas in the rearings of the previous two years the number of the

sexes were equal. As shown by the dates of the recovery of all the moths this year, given in the following table, there was a noticeable tendancy for the females to emerge slightly later than the males.

TABLE IV

Recovery of Halisidota Moths - 1936.

Dates	Number of Moths Males	Females	Totals
July 16	3	2	5
" 17	3	-	3
" 20	14	3	17
" 21	4	-	4
" 23	10	4	14
" 24	3	1	4
" 25	2	2	4
" 27	3	6	9
" 28	-	1	1
" 29	2	1	3
" 30	-	1	1
" 31	-	2	2
Aug. 6	-	2	2
Totals	44	25	69

On emergence, the majority of the moths were transferred to a separate cage containing a potted Douglas fir transplant for observations on oviposition. Sugar and water were also made available in the cage for the moths. The number of moths and the dates they were liberated in the new cage were as follows:

Dates	Males	Females
July 16	1	-
" 17	3	-
" 20	14	3
" 21	3	-
" 23	10	4
" 24	3	1
" 25	2	2
" 27	3	6

" 28	-	1
" 29	2	1
" 30	-	1
" 31	-	2
Totals	**41**	**21**

However, thr mortality was extremely high among the moths, practically all of them dying within two to four days after they were liberated in the cage. Only 355 eggs were deposited in the cage and of these 313 were laid in a mass on the base of the flower pot while the balance were on the floor of the cage. Eggs were first noticed on July 27 but hatching did not commence until August 15. The dead moths were removed from the cage as follows:-

July 20	-	2	males		
" 23	-	7	"	and 3	females
" 24	-	2	"		
" 27	-	13	"	" 4	females
" 30	-	9	"	" 6	"
Aug. 4	-	8	"	" 8	"

On removal the moths were preserved and at a later date counts of the undeposited eggs in each female were made. These counts were as follows:-

No.	Removed from Cage.	No. of Eggs.
1	July 23	320
2	" "	410
3	" "	477
4	" 27	363
5	" "	398
6	" "	419
7	" "	437
8	" 30	15
9	" "	289
10	" "	305
11	" "	422
12	" "	428
13	" "	456
14	Aug. 4	334
15	" "	351

16	Aug.4	353
17	" "	356
18	" "	374
19	" "	423
20	" ♀	428
21	" "	430

The number of undeposited eggs counted was 7782 which with the 355 eggs laid in the cage gives a total of 8137 eggs and an average of 387 eggs per female moth.

Moreover, two attempts were made to induce egg laying on twigs enclosed in wire netting cylinders in the field. The netting consisted of 12 strands to one inch. The first cylinder enclosed the tip of a branch of grand fir, Abies grandis, while the second contained the tip of a Douglas fir branch. One pair of moths was placed in each cylinder on July 16, but by July 20 the males were found to be already dying. By July 27 all four moths were dead. A few eggs were found on July 20 to have been laid in the cylinder on balsam, but a total of only 12 eggs were deposited, 10 on the wire netting and 2 on the tip of one needle. The undeposited eggs in the female removed from this cylinder was 264, a total of only 276 eggs for the specimen. In the cylinder on Douglas fir 98 eggs were found, these being laid on the wire netting and confined to an area of three square inches. In the female from this cylinder 325 eggs were undeposited, a total of 423 eggs for this specimen.

Parasites.

A total of 5 Diptera and 11 Hymenoptera adults were recovered this year from the reared colongy of Halisidota argentata.

Two of the Diptera which were recovered on June 4 and 11 are believed to be the parasite Uramyia Halisidotae (Towns.). In addition three puparia of what are also considered to be of the same species were recovered. One of these puparia was formed by a maggot found on April 20 on the floor of one of the cages. This maggot on being placed on soil in a plaster rearing block immediately dommenced to bury itself. However, as no adult had emerged the specimen was uncovered on August 6 and was found to have died within the puparium. The other two puparia were recovered from the original cage on June 4 and were transferred to the laboratory. However, on examination on July 8 both specimens were found to have died while still maggots.

The three other Diptera adults were recovered on April 20, June 1 and June 20 and consisted of unidentified species, the status of which have not been determined.

The 11 Hymenoptera adults recovered were all of one species, specimens of which have been forwarded to Ottawa for identification. 7 of the adults emerged from their pupal cases which were taken in the cages on June 4 and transferred to the laboratory. The dates of emergence of these specimens were as follows:-

June 10 - 1 specimen
" 11 - 2 specimens
" 12 - 1 specimen
" 15 - 2 specimens
" 19 - 1 specimen

Moreover, one adult emerged on June 13 from its pupal cage which had been taken in one of the cages on June 1. These emergences

indicate a pupal period of about 2 weeks for the species. Of the remaining three adults, one was taken in the original cage on June 4 while the other two were recovered in the same cage on June 20.

The single Hymenoptera parasite recovered in the rearing of Halisidota argentata in 1934 has since been identified by Mr. G. S. Walley as Meteorus species. No specimens of this species were recovered ~~this year~~ in 1935.

EXPERIMENT WITH SODIUM SELENATE.

In connection with the rearing of Halisidota argentata and on the suggestion of Mr. Geo. R. Hopping, who had a sample of the chemical on hand, an experiment was undertaken this year with sodium selenate. The object of the experiment was to determine whether or not the sodium selenate which might be absorbed by a plant when the chemical was applied in solution to the soil would have any toxic effect on caterpillars feeding on the plant.

Selenium is extremely poisonous and according to an article in Science, Vol. 78, No. 2015, page 124, selenium at the rate of 15 parts per million or even less in the soil, when added as sodium selenate, produced distinct chlorosis and stunting of wheat. Moreover, quantities as small as 1 part per million permitted growth and maturation with no visible symptons of injury to the plant, but when the grain or straw was fed to rats or guinea pigs, it produced a pronounced retardation in growth, followed by death after a few weeks.

In our experiment three Douglas fir transplants were potted and on April 8 and placed in three separate portable cages under field conditions. At the same time 15 Halisidota caterpillars were placed on each plant and definite quantities of sodium selenate, dissolved in water, were added to the soil of two of the plants, and third plant being reserved for a check. The amount of dry soil for each plant was approximately 10 pounds or 5000 grams and the amounts of sodium selenate added were as follows:-

Plant No. 1 - 50 milligrams. This was at the rate of approximately 10 parts of sodium selenate (or 4 parts of selenium) to 1 million parts of soil.

Plant No. 2 - 250 milligrams. This was at the rate of approximately 50 parts of sodium selenate (or 21 parts of selenium) to 1 million parts of soil.

Plant No. 3 - None - used as a check.

No effect of the chemical on the development of the caterpillars was evident. The specimens continued to feed, and in both cages No. 2 and No. 3 so stripped the needles that additional foliage had to be provided for them on May 23. The pupation of the caterpillars was completed in all three cages by May 30 and the emergence of the moths commences on July 20. The recoveries from each of the three cages were as follows:-

No. 1 - 8 Halisidota moths
2 Hymenoptera parasites
1 Diptera parasite puparium (dead)

Total - 11 specimens.

No. 2 - 14 Halisidota moths
1 Hymenoptera parasite

Total - 15 specimens.

No. 3 - 8 Halisidota moths
1 Hymenoptera parasite
1 Diptera parasite

Total - 10 specimens.

The recovery from the treated plant No. 2 was 100 percent, while the recoveries from the treated plant No. 1 and the untreated plant No. 3 were practically equal. Moreover, although the buds did not commence to open until nearly three weeks after the chemical had been applied, no visible effect was evident on the growth of the plants.

From these results it is apparent that insufficient quantities of the chemical had been used. Further experiments along similar lines will be undertaken in 1937 should the opportunity occur, but preference will be given to insects feeding on the current year's growth. However, it is more than probable that the chemical would have a marked toxic effect on the plant itself before sufficient of the poison is absorbed to effect caterpillars feeding on its foliage.

MADRONA SHIELD BEARER - Coptodisca arbutiella Busck.

Early in June 1935 a large arbutus or madrona tree, Arbutus menziesii Pursh., on the campus of the University of British Columbia was found by Mr. K. Graham to be heavily infested with the leaf mining Lepidoptera Coptodisca arbutiella Busck and the following observations are based in part on studies made at that time by Mr. Graham.

On June 14, 1935, the majority of the specimens were present in pupal cases. However, some emergence had already

taken place as both eggs and newly emerged larvae were also present. A considerable number of the eggs had been laid on the underside of the new leaves, and eggs which were transferred to the laboratory on that date commenced to hatch on June 21. A newly emerged larva was 1.2 mm. long while mature larvae attained a length of 3.4 mm. The species apparently overwinters in the larval stage as full pupal cases were found in large numbers on June 14 on the new leaves of a wild cherry growing up through the arbutus branches. A total of 34 holes cut by pupating larvae were found in one arbutus leaf.

From a series of pupal cases transferred on June 14, 1935, to the laboratory for rearing, 77 of the moths were recovered between June 22 and 29 inclusive, and one undteremined parasite emerged on June 24. In addition, several other parasites were recovered from the same material early in July, among which were the following two species:

1. Mirax sp.? ectodemiae Roh. (Det. Walley).
2. Amblymerus sp. near yerditor (Nort.) (Det. Gahan).

This year, 1936, infested leaves were taken from the same tree on March 30 and transferred to a rearing jar in the laboratory. The first pupal case from this material was formed by April 18 and by April 22, 30 such cases were present. Within the next week 17 additional cases were formed and the emergence of moths from the material commenced on May 11.

The first cases in the field this year were observed on April 30 and adults were found to be emerging in the field and depositing eggs on May 26. On May 13, 80 larvae in

Their cases were collected in the field and transferred to the laboratory for rearing. Thefirst emergence of moths from this material was taken on May 29 and a total of 37 were recovered from the material by June 5 when 55 more cases taken in the field were added. The emergence from this combined series of cases then continued until June 18.

A total of 20 parasite, including several species, were recovered this year, but their identification have not yet been verified.

ALDER SAWFLY - Hemichroa crocea Geoff.

On August 10 a small outbreak of the alder sawfly, Hemichroa crocea Geoff., was found in a clump of alders near the campus of the University of British Columbia. At that time the larvae were practically full grown and a series of them were transferred to a portable cage under field conditions for observation. The larvae continued to feed in the cage and it was necessary to replenish the foliage provided for them on August 15 and again on August 20. However, by August 24 larval development was apparently completed as practically all the specimens in the cage had either died or pupated by that date. By September 5 several adults had emerged in the cage and were depositing eggs in the axis of leaves, the eggs hatching about one week later. On September 8, 21 adults, all females, were taken in the cage.

In the field, very few larvae were to be found on August 24, what few specimens were present were very heavily parasitized with from three to four parasite eggs on each. On

September 9 no adults or eggs were located in the field, the brood apparently hibernating in the pupal cases.

An undetermined Hptera parasite was recovered from the material in the cage. Three adults emerged on August 31 in the laboratory from puparia taken in the cage on August 24 and an additional four adults were recovered in the cage on September 8 and 9.

CONTROL OF INSECTS IN OAK PLANKING.

On August 25 a report was received through the Forest Products Laboratory of a shipment of lowland white oak infested with borers. This shipment had been received from Memphis, Tennessee, by a local company which handles hardwoods. The shipment consisted of about 2000 feet of oak planking, 3 inches thick, 10 to 16 inches wide and from 10 to 14 feet in length, and had been placed in the company's warehouse which already contained a considerable stock of various other hardwoods. A proportion of most of the planks consisted of sapwood while a few showed a small amount of waning with the bark still intact.

On examination the damage proved to confined to the sapwood and an elytron of a species of Lyctus and several live adults of a small undetermined beetle were taken from between the planks. Specimens of the Lyctus since bred from a sample of the infested material (See Figures 11 and 12) proved to be L. planicollis Lec., while the second species, also bred from the same sample, was identified through Mr. Ralph Hopping as Tarostenus univittatus Rossi, a species belonging to the family Corynetidae and of European origin and reported in the United

States from Pennsylvania and Texas. In addition to these two species, several undetermined round-headed larvae were found under the strip of bark on several of the planks.

In order to eradicate the insects and to prevent any possibility of them spreading to other stock in the warehouse, arrangements were made for the entire shipment of oak to be treated in the dry kiln of the Forest Products Laboratory, the company agreeing willingly to being responsible for the entire handling of the lumber. A treatment of 7 hours at 100 percent humidity and a kiln temperature of 135° was decided to be sufficient. However, the run actually lasted 9 hours, the first 2 hours being required to heat the kiln to the 135°. The humidity was maintained at 100 percent, and the fan speed at slow during the entire 9 hours. Moreover, at the end of the run the kiln was left shut overnight, a period of about 15 hours.

The treatment was entirely successful with complete control of the insects and no appreciable change in the moisture content of the lumber and with no checking.

On August 27 a small portion of the untreated infested wood was placed in a rearing jar in the laboratory and from it the following recoveries have been made to date:

September	2 - 2	Tarostenus univittatus adults.
"	26 - 4	" " "
December	16 - 2	Lyctus planicollis Lec. adults.
January	4/37 - 3	" " " "
"	28 - 2	" " " "
February	3 - 3	T. univittatus adults.
"	8 - 2	" " "
"	22 - 1	" " "
March	5 - 2	" " "
	1	Hymenoptera adult.
"	8 - 1	T. univittatus adult.

MISCELLANEOUS REARINGS.

Cacoecia fumiferana Clem. (Spruce Budworm).

Several spruce budworm larvae were recovered this year from trees in the Botanical Garden of the University and reared in the laboratory. One larva taken on Picea engelmanni on June 4 was 15 mm. long. On June 8 the specimen was entering the prepupal stage and two days later had pupated. The moth, a male, emerged on June 20, a pupal period of 10 days. A second specimen also taken on June 4 on Pseudotsuga taxifolia was 16 mm. long. By June 9 the thoracic segments were beginning to swell and pupation was completed by June 9. The moth, a female, emerged on June 20, a pupal period of 11 days.

On June 9 four other spruce budworm larvae were taken on Pinus contorta. One of the specimens which appeared to be parasitized, was dead the next day and a parasite pupal case present, the parasite from which emerged on June 17. Of the other larvae, one reached the prepupal stage by June 18 and pupated June 20. The moth, a male, emerged June 27. The remaining two specimens pupated on June 20 and 22 and the moths, both females but small, emerged on June 29. These two moths were preserved and counts later made of the eggs present in their abdomens. However only 79 eggs were found in one and 156 eggs in the other.

Also on June 9 two larvae were taken on Picea sitchensis. By June 17 one had died and a parasite cocoon was present from which the parasite adult emerged on June 29.

The food plant of the second larva was changed to Douglas fir on June 20 and the larva pupated by June 26. The moth, an undersized male emerged on July 6, a pupal period of 10 days. A budworm pupal case was also recovered on June 9 on Pseudotsuga taxifolia and from it a male moth emerged 8 days later. Cacoecia rosaceana Harris (Det. McDunnough).

One larva of this species was taken on June 9 on Pinus monticola in the Botanical Garden. The specimen was green in colour with black head and thoracic shield and 11 mm. long. The larva pupated on June 25 and the moth emerged on July 3, a pupal period of 8 days.

A second moth of this species emerged on July 2 from a pupal case found on June 24 in a cage used for rearing Douglas fir webworm. The larva had apparently been introduced to the cage on May 20 with fresh Douglas fir foliage. Epinotia sp. (Det. McDunnough).

On March 20 several small larvae were taken feeding between leaves on an Arbutus held together by webbing. The larvae were a dirty light brown with dark head and thoracic shield and were approximately 9 mm. in length. The material was transferred to a rearing jar in the laboratory and by April 18 several had pupated. Two moths emerged on May 11 and a third was recovered on May 26. However, the only moth observed in the field was captured on July 7. Oenerostoma piniariella Zeller. (Det. Busck).

This species was first recovered from Pinus monticola in the University's Botanical Garden on July 26, 1935. This

year an additional series of the moths were taken on the same tree on July 7 and at the same time a number of the same pupae were transferred to the laboratory. The moths continued to emerge in the laboratory until July 20.

Only One parasite was recovered from the material this year but in 1935 three specimens were taken which have since been identified by Mr. A. B. Gahan of the United States National Museum as Achrysocharella n. sp. Anisandrus pyri Peck.

On June 4, 1935, samples of willow from Langley Prairie, infested with this species were caged but no definite emergence of the adults occurred that year. This year the pieces were recaged on April 14 and on April 16 and 17, 33 males and 66 females were recovered from the material. Moreover, an additional 19 males and 7 females were taken in the cage on May 1.

In June, Mr. T. Wells, superintendent of the Provincial Green Timbers Forestry Station, submitted specimens of this species which he had found in the spring attacking and killing Weigelia a t the Station. Mr. Wells also reported that the same species is frequently found attacking plum trees in the same district.

The hosts from which Anisandrus pyri have been recovered by us in this district during the past three years include: apple, plum, pear and cherry trees, Japanese ornamental cherry, Plane trees (Platanus), walnut (Juglans), Weigela, and willow (Salix).

Coelostethus quadrulus Lec.

Coelostethus quadrulus Lec.

In addition to specimens of this wood boring beetle obtained on August 6 from the foundation timbers (See Figure 8) of a house in New Westminster, B. C., several adults and two larvae were dug on October 19 from a portion of an old wooden crate, presumably spruce, which had been kept under a porch of a local residence. Moreover, additional adults of the same species were recovered on November 13 from several pieces of alder fire-wood which had been cut for several years and piled out-doors. On moving the wood this fall the owner found the infested sticks at the bottom of the pile.

Our list of hosts for this Anobiid in the coast district now includes red cedar, Douglas fir, spruce and alder. However, in each case the condition of the infested material was similar, being several years old and having been exposed to considerable moisture.

Xylobiops basillare Say.

A report of insect damage to hickory which had been imported from the south eastern States was received on February 22 from a local manufacturer of laminated ski. On examination the damage was found to be confined to the sapwood of one piece 1" X 4" x 6". The work resembled that of a furniture beetle (See Figure 9), but as no adults were present a portion of the infested wood was placed in a rearing jar in the laboratory. Commencing on July 29 eight adults of a Bostrichid, identified by Mr. Ralph Hopping as Xylopiops basillare Say,

emerged from the sample. The dates of the recoveries were: July 29 - 1 specimen, August 8 - 1 specimen, August 28 - 2 specimens, September 2 - 1 specimen and October 1 - 3 specimens.

Habrobregma sp.

A small sample from a wicker chair infested with borers was received on May 21. Two dead adults, two pupae and several grubs of an Anobiid were found in the sample. The pupae were placed in a plaster rearing block in the laboratory and these transformed to adults on June 6 and 9. The species was identified by Mr. Ralph Hopping as Habrobregma, probably, gibbicollis Lec., the specimens appearing to be immature.

Lyctus sp.

On September 30 a sample of infested Australian gumwood was received from a local importer of hardwoods. The sample, 1½" x 1½" x 18", consisted of about 1/3 sapwood which was riddled by what appeared to be Lyctus work. (See Figure 10) The piece was cut into three sections which were placed in a rearing jar in the laboratory. However, the emergence to date has consisted of only one Lyctus adult which was recovered on November 18.

Bark Beetles.

A series of Dryocoetes affaber Mannh. were recovered between April 30 and May 13 from a 3 foot sitka spruce log which had been caged in 1935 and recaged this spring. In 1935 series of Hylurgops rugipennis, Polurgus pumilus and Cryturgus borealis were recovered from the same log.

Immature adults and pupae of Dendroctonus obesus Mannh.

presumably, were taken on August 3 from a sitka spruce in the park at Maple Ridge, B. C. and between July 20 and 30 a series of Diptera, Lonchaea sp., were recovered from material taken from the same tree on July 14. This later material had consisted of slabs of bark which were caged, and puparia taken from the Dendroctonus galleries and placed in plaster rearing block in the laboratory.

On May 1 nine Scolytids, identified by Mr. Ralph Hopping as Pityophthorus sp., emerged from a section of willow which had been attacked in the spring of 1935 by Anisnadrus pyri.

IDENTIFICATION OF MISCELLANEOUS INSECTS.

In the investigation of damage to the lead sheathing of a telephone cable in 1934 a western red cedar telephone pole which had been in service for at least 15 years, was caged, and from it a number of Hymenoptera were recovered. (See Annual Report for 1934). This material was submitted to Ottawa for identification and the following determinations made by Miss Grace Sandhouse of the United States National Museum have been received through Mr. G. S. Walley:

Heriades carinatum Cress. - 4 specimens - emerged on June 12, 1934.
Stelis sp. - 1 specimen - emerged June 12, 1934.
Ellampus sp. - 1 specimen - emerged May 14, 1934.
Passaloecus sp. - 3 males and 2 frmales - emerged May 11 and 14, 1934.
Osmia lignaria Say. - 2 specimens - emerged April 12, 1934.
Osmia aprilinia atrovirens Sand. - 1 specimen emerged April 12, 1934.

The following determinations of miscellaneous insects recovered during 1935, have also been received through Mr. G. S. Walley:

Lonchaea sp. n. I. (Det. O. Peck) - Diptera reared from cones of Abies grandis and referred to in the 1935 Annual Report under the heading of Miscellaneous Rearings, Cone Insects.

Lonchaea sp. n. II. (Det. O. Peck) - Emerged in July from caged slabs of sitka spruce bark infested with Hylurgops rugipennis, Cryturgus and Dolurgus and also from puparia taken from galleries of H. rugipennis in sitka spruce.

Myoleja sp. (Det. O. Peck) - Diptera emerged September 13, 1935, larva a maple leaf miner.

Apanteles solitarus (ratz.). (Det. G. S. Walley) - A larval parasite of satin moth. Hymenoptera adults recovered from reared specimens in May 1934 and July 1935. (See under 'Satin Moth' in Annual Reports for 1934 and 1935.)

Coast Forest Insect Laboratory.

List of Equipment.

(as on March 15, 1937.)

Scientific.

1 Spencer binocular dissecting microscope, complete with 3 sets of eye pieces, 3 objectives, low stand and case.
1 Bausch & Lomb stage micrometer.
1 Micrometer ocular disc.
1 Bausch & Lomb hand lens, X 15.
1 Zeiss monocular field glass, X 6, with leather case.
1 Negretti & Zambra hygrothermograph.
2 " & " minimum registering thermometers.
2 " & " maximum " "
1 Unmatched set Tycos maximum and minimum registering thermometers with panel. (Maximum thermometer - 12" mercury. Minimum thermometer - 10", coloured spirit.)
1 Set Tycos wet and dry thermometers mounted on panel.
2 Bak-Fin thermometers in nickel cases.
1 Edney swing psychrometer.
1 Pocket type aneroid barometer.
1 Cruiser's compass.
1 Mattson increment borer, 10".
1 Zeiss Ikon Maximar camera, 9 X 12 cm., complete with Compur shutter #1178457, Zeiss Tessar F/4.5 lens #1188356, focussing ground glass and leather case.
1 Dremophot automatic exposure meter.
1 Metal tripod.
1 Tilting head attachment for tripod.
1 Luer B-D syringe.
1 Vernier type calliper.
1 LaMotte Soil Testing Set.
1 Electric hot plate.
5 Schmitt boxes.
2 Pairs scissors.
4 Pairs forceps.
1 Ruling pen.
3 Pyrex glass beakers - 100 cc., 250 cc. & 400 cc.
1 100 cc. graduated cylinder.
19 Small Riker mounts (11 used, 8 empty).
29 Medium size Riker mounts (28 used, 1 empty).
22 Large size Riker mounts (all used)
18 Wide-mouth bottles.
4 Slide boxes, wood, capacity 25 slides each.
1 Zeiss Ikon sky filter.

Office.

1 Flat-top office desk.
1 Swivel chair.
1 Three-drawer steel filing cabinet.
1 Underwood standard portable typewriter.
1 Wire letter basket

List of Equipment-March 15/37 - 2 -

1 Goose-neck desk lamp.
1 Extension cord.
12 Filing boxes for bulletins, etc. (red).
1 Calendar pad holder.

Field.

1 Richardson collapsable collecting net.
1 Steel tape, 50'.
1 Eiderdown sleeping bag.
1 Tarpaulin.
1 Canvas carrying case.
1 Wood's pack sack.
1 Coleman camp stove.
1 Coleman lantern.
1 Two-man cooking outfit.
1 McClarey 2-gal. coal oil can.
1 SMP 1-gal. coal oil can.
1 Double-bitted axe.
1 Boy's axe.
1 Spear & Jackson 'Superior' hand saw.
1 Henry Wilson & Son hand saw.
1 Cross-cut saw, 4'
1 Cross-cut saw, 5'
2 Hammers.
1 Long-handled shovel.
1 Rake.
1 Carborundum stone, round.
1 Chisel, 3/8".
1 Gouge, 3/4".
1 Wood scraper, 5".
1 Tin funnel, 5½" top.
1 United Drug Co. W. 151 first aid kit. (Depleted).
12 Portable cages, 18" x 18" x 30".
6 Glass insect breeding jars, 5" square, (less 1 broken).
6 Flower pots, 8" top, (less 2 broken).
1 Knapsack.

Books.

'Principles of Forest Entomology' - S. A. Graham.
'Insects of Western North America' - E. O. Essig.

Respectfully submitted,

W.G.Mathers,
Jr. Entomologist.

Figures 1 and 2.

Showing progress being made in removal of debris in Stanley Park, Vancouver, B.C., caused by the severe storms of the winter 1934-1935. Stumps of uprooted trees righted after cutting. Compare with Figure 4, 1935 Annual Report.

Photo by W.G.M.

Figure 1.

Figure 2.

Figure 3.

Showing the same area as in Figure 3, 1935 Annual Report, but taken after the removal of the debris resulting from the storms of the winter 1934-1935.

Photo by W.G.M.

Figure 4.

Showing potted Douglas fir transplant in portable cage, used for rearing caterpillars of Halisidota argentata Pack.

Photo by W.G.M.

Figure 3.

Figure 4.

Figure 5.

Showing group of Abies grandis at Duncan, B.C. killed by bark beetles in 1935 and 1936. Trees average 12" D.B.H. and attacked by both Scolytus ventralis Lec. and Pseudohylesinus granulatus Lec.

Photo by W.G.M.

Figure 6.

Showing bark beetle engravings on wood surface of the trunk of one of the trees shown in Figure 5.

Photo by W.G.M.

Figure 5.

Figure 6.

Figure 7.

Showing termite damage, coupled with dry rot, to foundation timber of private residence in New Westminster, B.C.

Photo by W.G.M.

Figure 8.

Showing work of Coelostethus quadrulus Lec. in base of studding taken from same house as sample shown in Figure 7.

Photo by W.G.M.

Figure 7.

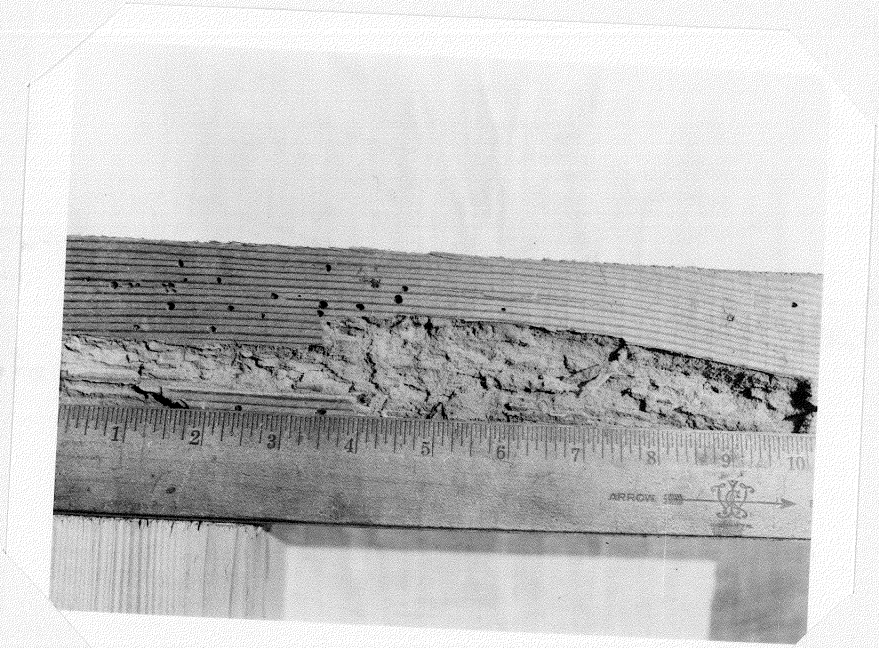

Figure 8.

Figure 9.

Showing sample of imported hickory with holes made by *Xylobiops basillare* Say.

Photo by W.G.M.

Figure 10.

Showing work of *Lyctus* sp. in Imported Australian gumwood.

Photo by W.G.M.

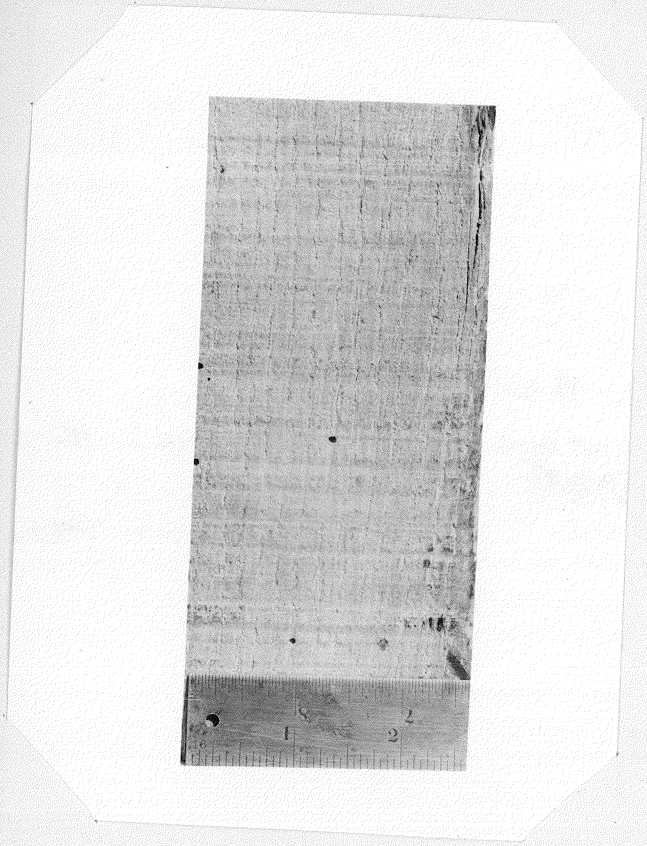

Figure 9.

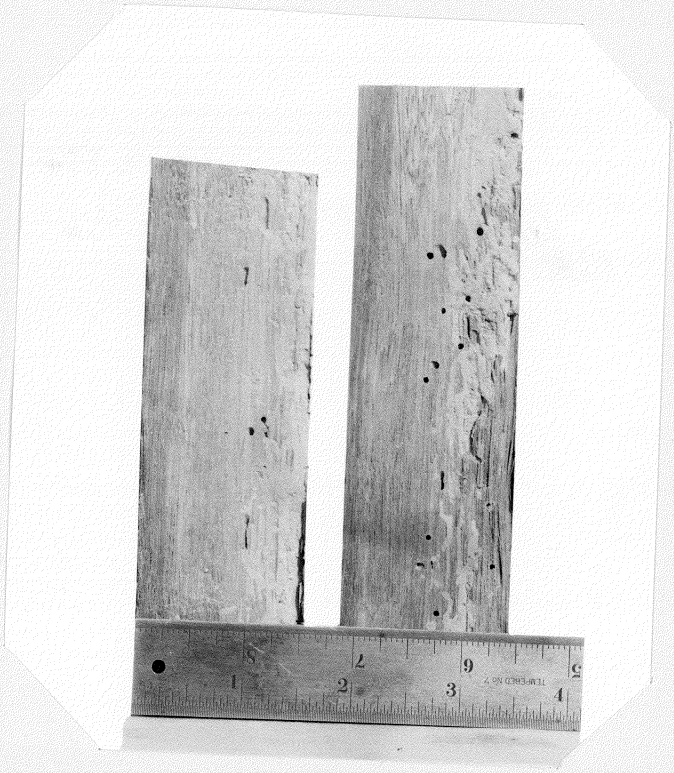

Figure 10.

e3

Figures 11 and 12.

Showing work of Lyctus pāanicollis Lec. and Tarostenus univittatus Rossi in imported lowland white oak.

Photo by W.G.M.

Figure 11.

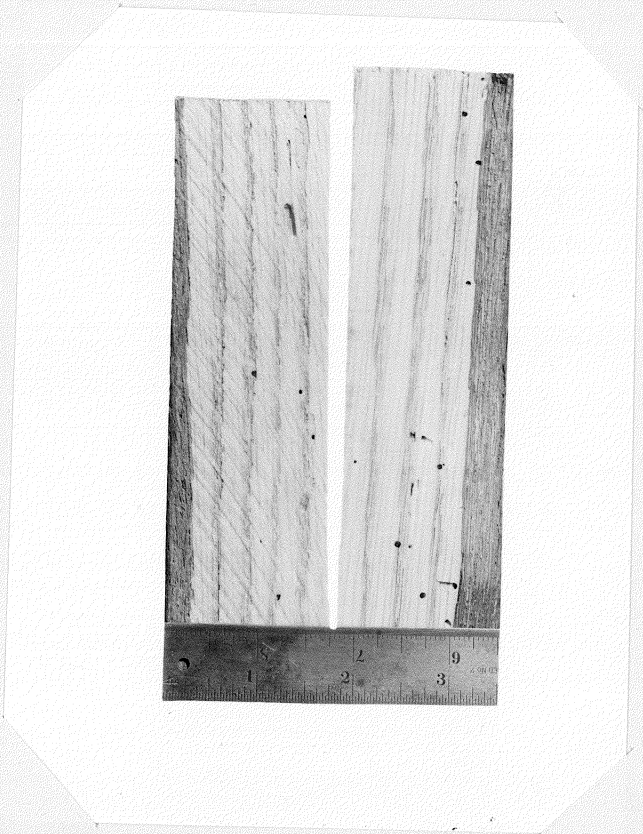

Figure 12.

Figure 13.

Showing logs of the Repellent Studies on Timber Berth X with Log No. 1 in the immediate foreground.

Photo by W.G.M.

Figure 14.

Same as Figure 13 but with Log No. 12 in foreground.

Photo by W.G.M.

Figure 13.

Figure 14.

Report on the Fernie Field Station, 1936.

by

Hugh B. Leech.

Fernie was reached on May 1st, via Spokane, Washington and Bonner's Ferry, Idaho, because of B.C. road conditions.

A slight amount of scouting in larch stands along the road between Tonasket and Republic, Washington, and just south of Bonner's Ferry, Idaho, did not show signs of the Larch Sawfly (Lygaeonematus).

At Fernie and at Hosmer the larch foliage was from ¼ to ½ inch long, and at Elko was more advanced still, on May 2nd. On May 10, 1935, there was still snow on the ground at Fernie and Hosmer.

The Larch Sawfly (Lygaeonematus erichsonii Hartig.)

In 1935 the light infestation at Kitchener was reported as the most westerly point yet reached by the sawfly.

In an attempt to check this advance, Mesoleius tenthredinis Morley were released at Kitchener this year; the sawfly larvae were very appreciably more numerous, but the damage is still slight. A two-day scouting trip along the east shore of Kootenay Lake (August 2nd and 3rd) showed that the sawfly had advanced about forty-five miles beyond Kitchener, though very few eggs were laid this year.

The Elk Valley situation has improved greatly. The Upper Elk and Hosmer areas were cruised during the latter part of July when almost 100% of the larvae had left the trees, and not a single tree was found to be heavily enough defoliated to be worth working for 1937 cocoon collection. One explanation of this will be found in the summary of cocoon cageing and examinations (page), in which it is seen that though the introduced parasite Mesoleius tenthredinis has increased strongly, the most important control seems to be the fungus Isaria.

Damage.

Between 5 and 10 per cent of the trees on the Upper Elk

area and at Hosmer and Lizard Creek show a definite setback, due presumably to defoliation by the Larch Sawfly in preceding years. In such cases the foliage is shorter and often the outer parts of the branches, or even whole sections of branches, are bare; relatively few fresh terminals are put out.

On each area there are a few trees which have had a more continuous heavy defoliation, and which now appear very ragged and unthrifty.

In some cases the trees show open running sores on the trunks, probably due to a virus disease, and very similar in appearance to the fireblight of apple trees. A few branches die directly around such sores, but the remainder of the tree appears to be healthy.

In May, 3313 sawfly cocoons were collected on the Upper Elk, and 3320 at Hosmer; on June 19th 121 more were taken at Hosmer. These cocoons were all caged in an attempt to recover Mesoleius for liberation elsewhere, and the Japanese Tachinid Zenillia sp.

Following are the emergence tables and accompanying data.

Experiment #17601, Hosmer Area.

Collections were made at or very close to the actual point of parasite liberation (Mesoleius tenthredinis and Zenillia sp.) in 1935, as follows:--

May 2nd, 7th and 8th	593	cocoons.
" 12th	960	"
" 13th	953	"
" 23rd	331	"
" 24th	569	"
June 19th	121	"
	3527	"

Of these, 86 were shown by careful examination to be empty, and were discarded. Hence 3441 cocoons were used in the cages.

Emergence Table, Hosmer Area

17601.

Date	Lygaeonematus erichsonii		Mesoleius tenthredinis.		Bessa selecta		Cocoons removed re fungus Isaria.
May	Male	Female	M.	F.	Puparia from cocoons	Adults from cocoons	
18	-	-	-	-	-	-	86
19	-	-	-	-	-	-	8
26	-	-	-	-	-	-	135
28	-	8	-	-	-	-	-
29	-	9	-	-	-	-	-
30	1	27	-	-	1	-	240
31	-	19	-	-	-	-	-
June							
1	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-
3	-	~~14~~	~~-~~	-	-	-	128
4	-	10	1	-	-	-	123
5	-	6	-	-	-	1	-
6	-	1	1	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
(*)9	-	3	1	-	-	-	220
10	-	2	4	-	-	-	-
11	-	-	5	-	1 fly	-	-
12	-	-	5	-	-	-	-
13	-	-	11	-	-	-	-
14	-	-	16	5	-	-	339
15	1	-	5	5	-	-	-
16	-	1	3	3	-	-	-
17	-	-	3	7	-	-	-
18	-	-	-	2	-	-	-
19	-	-	3	4	-	-	246
20	-	-	-	7	-	-	-
21	-	-	3	6	-	-	132
22	-	-	-	8	-	-	-
23	-	1	-	1	-	-	-
24	-	1	-	-	-	-	-

(*) One dead male Mesoleius in cocoon opened.

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Emergence Table, Hosmer Area 17601 (continued).

Date June	Lygaeonematus erichsonii Male	Lygaeonematus erichsonii Female	Mesoleius tenthredinis. M.	Mesoleius tenthredinis. F.	Bessa selecta Puparia from cocoons	Bessa selecta Adults from cocoons	Cocoons removed re fungus Isaria
25	1	19	-	4	-	-	-
26	-	26	2	1	-	-	-
27	-	13	-	1	-	-	-
28	-	6	-	-	-	-	-
29	-	4	-	-	-	-	-
30	-	1	2	-	-	-	-
July							
1	-	2	1	1	-	-	-
2	-	-	3	2	-	-	-
3	-	-	1	-	-	-	-
4	-	-	4	1	-	-	-
5	-	-	6	3	-	-	-
6	-	-	4	3	-	-	164
7	-	-	2	2	-	-	-
8	No collection.		Away from camp.				
9	-	-	4	1	-	-	-
10	-	-	4	1	-	-	-
11	-	-	2	5	-	-	-
12	-	-	3	3	-	-	-
13	-	-	2	10	-	-	-
14	-	-	3	2	-	-	112
15	-	-	-	2	-	-	-
16	-	-	1	4			
17	-	-	1	3	-	-	-
18	-	-	1	6	-	-	-
19	-	-	1	-	-	-	-
20	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-
22	-	-	1	3	-	-	-
Totals:	3	166	109	107	1	1	1805

732
2537
112
~~3225~~

Hosmer area, 17601: Final analysis of remaining cocoons.

Lygaeonematus.

1. Larvae: Alive - 139.
   Dead (fungus) 732.
2. Pupae - dead - 11.
3. Adults, dead - 12.

2425
732
1693
112
1805

Mesoleius tenthredinis.

1. Larvae, dead - 71.

2. Pupae, " - 29.

3. Adults, alive (2 males
(6 females.
dead-19.

4. Mesoleius in cocoons, killed by Coelopisthia - 9.

Cocoons from which Coelopisthia emerged - 185.

Experiment 17602, Upper Elk area.

Collections were made as follows:--

May 9th - 1204 cocoons.
" 11th - 1478 "
" 18th - 756 "
3438 "

Of these, 125 were empty; hence 3313 cocoons were used in the cages.

Lumberton Area.

12 Lygaeonematus erichsonii cocoons collected at Lumberton by Mr. H. Richmond, showed:--

2 cocoons, each containing a dead adult sawfly (female).

4 cocoons attacked by fungus (Isaria).

6 cocoons attacked by Coelopisthia nematicida.

Emergence Table, Upper Elk, #17602.

Date	Lygaeonematus erichsonii		Mesoleius tenthredinis.		Bessa selecta	Cocoons removed re fungus
	Male	Female	M.	F.	Puparia & emergence, #17602A.	Adults ex cocoons	Isaria.
May							
17	-	1	-	-	-	-	139
24	-	1	-	-	-	-	-
25	1	2	-	-	-	-	-
26	3	5	-	-	10 pup.	-	189
27	-	12	-	-	1 "		34
28	1	11	-	-	-	-	-
29	-	11	-	-	-	-	Coelopisthia emergence started
30	1	20	-	-	2 pup.	-	64
31	-	15	-	-	-	-	-
June							
1	-	-	-	-	-	-	-
2	-	8	-	-	-	-	-
3	-	6	-	-	-	-	-
4	1	3	1	-	1 pup.	1	45
5	-	9	1	-	-	2	-
6	-	1	1	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
9	-	9	4	-	-	1	72
10	-	3	7	-	emergence	1	-
11	-	1	1	-	2 flies	1	-
12	-	-	8	1	2	-	-
13	-	4	14	2	2	-	-
14	-	-	25	4	1	-	119
15	-	-	11	5	-	-	-
16	-	3	9	4	-	-	-
17	-	-	7	8	-	-	-
18	-	2	27	28	3	-	-
19	-	-	22	13	-	-	-
20	-	-	1	15	-	-	110
21	-	2	8	19	-	-	-
22	-	-	-	4	-	-	-
23	-	2	1	17	-	-	-
24	-	6	-	2	-	-	-
25	1	15	3	9	-	-	-
26	1	25	1	2	-	-	-
27	1	25	7	5	-	-	-
28	-	2	5	3	-	-	-
29	-	9	3	1	-	-	-
30	-	3	15	5	-	-	-
July							
1	-	4	6	1	-	-	-
2	-	-	13	12	-	-	-

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Emergence Table, Upper Elk, #17602 (continued).

Date	Lygaeonematus erichsonii		Mesoleius tenthredinis.		Bessa selecta Puparia & emergence, #17602A.	Adults ex cocoons	Cocoons removed re fungus Isaria
	Male	Female	M.	F.			
July							
3	-	-	12	6	-	-	-
4	1	-	12	3	-	-	-
5	-	-	10	14	-	-	-
6	-	-	25	24	-	-	-
7	-	2	12	13	-	-	128
8	No collection. Away from camp.						-
9	-	15	27	-	-	-	-
10	-	-	10	7	-	-	-
11	-	-	7	14	-	-	-
12	-	-	1	12	-	-	-
13	-	-	7	11	-	-	-
14	-	-	5	14	-	-	-
15	-	-	1	1	-	-	59
16	-	-	2	6	-	-	-
17	-	-	1	6	-	-	-
18	-	-	1	2	-	-	-
19	-	-	1	2	-	-	-
20	-	-	2	4	-	-	-
21	-	-	-	-	-	-	-
22	-	-	-	4	-	-	-
Totals:	11	221	325	330	14 puparia, 6 yielding 10 flies.		959 539 1498

Upper Elk cages, Experiment 17602. Final analysis of remaining cocoons.

Lygaeonematus. 1. Larvae alive - 169 = carryover.
dead (fungus) 539.

2. Pupae dead - - - - - 15.

3. Adults dead - 18.

4. Adults parasit. by Coelopisthia - 2.

Mesoleius tenthredinis.

1. Larvae dead - 165.

2. Pupae alive - 5.
dead - 57.

3. Adults alive- (3 males.
(17 females.

dead - 53.

4. Mesoleius stages killed by Coelopisthia - 36.

Cocoons from which Coelopisthia emerged - 272.

Summary of Cage Experiments.

1. Sawflies.

In 1935, 32% of the cocoons caged from the Hosmer area produced living sawflies, and 47% of those from the Upper Elk. This year the percentages were 5 and 7 respectively.

2. Fungus (Isaria).

This appears to be the most important single factor in control, and has increased considerably during the last year, though whether this increase would have taken place without the 17° below zero frost of October 30 - Nov. 1st is hard to judge.

It should be noted that the figures in the table below do not show the real importance of the fungus in the field. In each case a special attempt was made to exclude cocoons showing external evidence of fungus from the cage experiments, since these latter were primarily for the recovery of Hymenopterous and Dipterous parasites.

Isaria appears to attack Mesoleius stages to a small extent.

3. Coelopisthia nematicida.

This does not seem to increase nearly as rapidly as one would expect from its life history. It would perhaps be of considerable importance if it did not have to compete with the fungus.

4. Mesoleius tenthredinis Morley.

Presuming that our liberations of 1934 introduced the species into British Columbia, the increases noted this year over last are very satisfactory. It is to be hoped that the species will be just as successful on the areas where it was freshly liberated this year. As far as the Upper Elk, Hosmer and Lizard Creek areas are concerned, there were hardly more than enough caterpillars on the trees to provide host materials for Mesoleius, especially in the first case. The Rosen Lake and Lumberton conditions (sawfly larvae) are very similar to those at Hosmer.

5. Bessa selecta.

This native (?) Tachinid is becoming decidedly more numerous. None were recovered in the main cage experiments last year. This season seven flies emerged directly from the sawfly cocoons, while fourteen larvae emerged from other cocoons, and formed puparia in the soil. This variable habit was noted

on page ~~15~~ 21 of the ~~1934~~ 1935 report on the Field Station. The species is most common on the Lizard Creek and Fernie City (Wilson's) areas.

Life history studies for this species were planned but did not materialise. This should be done in 1937, as the species is increasing in importance.

6. Japanese Tachinid (Zenillia sp.)

Of this species, 756 were liberated at Hosmer in 1935. Not a single specimen was recovered this year, nor were any seen in the field.

7. Frost.

During the night of October 30th and 31st and Nov. 1, 1935, a 17° below zero frost was experienced at Fernie. There was no snow on the ground at the time, and many native trees, especially cedars and pines, were seriously injured. Cultivated fruit trees were killed in many orchards and gardens.

The effect of this frost on sawfly larvae and their parasites is not definitely known. If any number of Lygaeonematus larvae were killed, the credit is probably given to the fungus Isaria in the above tables of cocoon examinations. It is highly probable, however, that most of the Mesoleius larvae recorded as dead were killed by frost. (See Table, next page).

Sample Plots.

Plots Number 1 and Number 3 were spoilt during the winter of 1935-36. A contractor cut the trees for railway and mine ties and mine props. Some of the best logs were used in a log building.

The larch stumps and tops were infested this summer by ambrosia (Trypodendron and Gnathotrichus) and bark (Dendroctonus pseudotsugae) beetles. Where the attack was very heavy, the bark and cambium mining Lepidopterous larvae larvae reported on in 1935, were apparently killed. In other cases they were set back so much that no pupae or adults were recovered by the end of July.

Experiment number and area.	Year	No. of of cocoons in exp.	% cocoons producing living sawflies.	% mortality due to fungus Isaria.	% of parasitism by Coelopisthia.	% of cocoons from which Mesoleius emerged.	% of cocoons containing Mesoleius (all stages, dead & alive).
17601 Hosmer	1935	2319	31.7	55.3	8.7	0.25	0.38
	1936	3441	4.9	74.3	5.3	6.2	10.2
17602 Upper Elk	1935	2081	47.1	35.6	5.6	2.8	7.4
	1936	3313	7.0	46.5	8.2	20.0	30.2

Plot #2.

Trees #176-185 inclusive. No defoliation in 1936.

Parasite Liberations, 1936.

One of the primary objects of the collection and cageing of 6754 larch sawfly cocoons was to secure enough Mesoleius tenthredinis to make liberations along the westward line of advance of the sawfly.

A total of 871 Mesoleius were recovered:

	Males.	Females.
Hosmer	109	107
Upper Elk	325	330

As the emergence was spread over a period of 48 days, some form of cold storage was necessary to hold the daily emergences till a sufficient number of each sex was present to make a liberation worth while. No ice was commercially available, so two 4-gallon crocks were sunk in damp soil in a shady spot. An almost constant temperature of 52°F. was obtained.

The Mesoleius were placed in large glass jars, and were provided with a sugar solution food, and sections of copper netting to allow them to stay off the floor of the jars. Both sexes were placed in the same jar, and copulation was noted on many occasions; it is considered that a large percentage of the females were fertilized previous to liberation.

Some of the Mesoleius seemed to be weak upon emerging, and died soon; a few were cripples; others died in the cooler (especially males, during the first two weeks of the emergence period) and a few were lost due to flood conditions following a small cloudburst. A total of 276 males and 380 females, all reared at the Field Station, was released; hence the mortality in holding material was 158 males and 57 females.

Belleville Material.

During the early part of the season it was feared that the Field Station experiments would not produce enough Mesoleius to make successful liberations, and a request was sent to Mr. A.B. Baird for about one hundred specimens. A shipment of 82 living males and 77 living females was received on July 7th, and released at Kitchener, with Fernie-reared material, on July 8th. These Belleville specimens are included in the totals of the following table:--

Table of *Mesoleius tenthredinis* liberations, 1936.

Point of release	Date released	Males	Females	Totals	Wind	Time	Approximate Temperature.
Field station	July 2-3	29	20	93	nil	-	-
	23.VII.	8	36		s.e., light.	5 p.m.	88°F.
Rosen Lake	1.VII	30	40		nil	noon	85°F.
	15.VII	54	105	229	light breeze from n.w.	3 p.m.	86°F.
Lumberton	17.VI.	40	29		nil	6 p.m.	69°F.
	22.VI	15	21	105	nil	5 p.m.	84°F.
Kitchener	22.VI	55	79		nil	3.15 p.m.	90°F.
	8.VII	45	50		light w. breeze	3 p.m.	86°F.
	Belleville shipment 8.VII.	82	77	388	"	"	"
Totals:		358	457	815			

Mr. Hector Richmond very kindly made the June 22nd liberation at Lumberton, while the writer went on to Kitchener that day.

Parasitic Fungus.

Beauveria bassiana (Bals.) Vuill.

One gram of the spores of this fungus were received at the Fernie Field Station, with orders to use them experimentally on Larch Sawfly larvae.

Experiments were attempted as follows:--

1. Four small trees, each about 8 ft. high, were selected and carefully examined, all larvae being removed from them.

2. Larvae of Lygaeonematus erichsonii were collected in the field, chiefly on the Lizard Creek area. An attempt was made to use only two and third instar larvae; more mature larvae might complete their development and leave the trees before any evidence of fungus damage could be noted. Each caterpillar was carefully examined for Tachinid (Bessa selecta) eggs.

First instar larvae would probably have been satisfactory as far as the fungus was concerned, but it was thought that they were too delicate; mechanical injury, or failure to establish themselves on the new foliage, might complicate the records.

3. The Beauveria spores were mixed with sifted flour, 1 gram of spores to 350 grams of flour. A small hand dust-sprayer was used to apply the mixture. The trees were treated as follows:--

Tree #1.

400 Lygaeonematus erichsonii larvae were placed on it on July 17th. The tree was dusted (lightly before putting the larvae on, and again after) with the spore-flour mixture.

Tree #2.

Data the same as for Tree #1. This tree should have been dusted a second time, but during the interim word was received from Mr. A.B. Baird that Beauveria bassiana would be of very doubtful value when used on an area in which the parasite Mesoleius tenthredinis was already doing so well. Mr. Baird stressed the fact that presence of the fungus would complicate all future rearing experiments very much. Hence it was thought unadvisable to liberate additional spores.

Tree #3.

400 L. erichsonii larvae placed on the tree. Dusted with flour only. (This tree was dusted before #1 or #2, to prevent any chance of contamination by having spores in

the duster. No two of the four trees are within less than one hundred yards of each other). This is a check tree.

Tree #4.

400 L. erichsonii larvae placed on it. No flour or spores applied. This is a check tree.

Results.

Negative. Periodic examinations during the remainder of July showed the larvae to be feeding and acting in a normal, healthy manner. A final examination was made on July 31st; no larvae were on the trees; all had matured, and dropped to the soil.

The failure of the fungus Beauveria bassiana to establish itself is due probably to the hot dry weather and drying winds prevalent during the last half of July. This is apparently a blessing in disguise, according to Mr. Baird's report on his experience with the fungus in Eastern Canada.

The Larch Looper.

Macaria incolorata Dyar.

Pupae of this species were found in the duff under larch trees during sawfly cocoon collection work.

One species of Hymenoptera and four examples of a parasitic fly were reared.

Some pupae were found to be attacked by a fungus, apparently Isaria.

Other Insects Studied:

A dozen or so species of Lepidoptera were reared to secure the host records. These moths are being submitted to Dr. J. McDunnough.

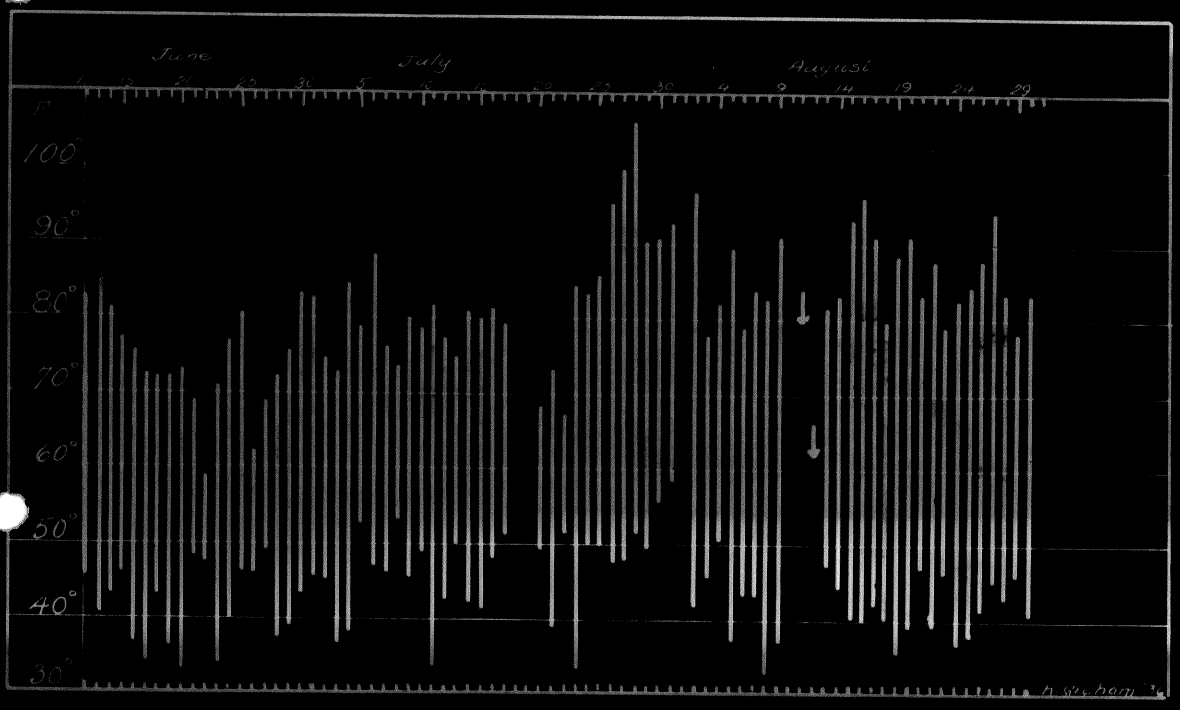
Temperature Readings at Field Station.

1936 May	Max.	Min.	Mean	Remarks
7	68.5	Not taken	-	Clouded, rain in p.m.
8	67.5	40.0	53.8	Clear
9	75.0	33.5	54.3	" , windy.
10	77.5	35.0	56.3	Clouded, sultry.
11	76.0	40.0	58	Rain in early a.m.; clouded to clear, windy.
12	77.0	33.5	55.3	Clear, windy
13	85.5	33.5	59.5	Clear to clouded. Very sultry.
14	83.0	40.5	61.8	Clear to clouded, sultry.
15	62.0	41.5	51.8	Rain.
16	63.5	40.0	51.8	Clouded; rain.
17	66.5	35.5	51.0	Clouded; windy.
18	81.0	31.0	56.0	Clear, clouded in a.m.
19	67.5	38.5	53.0	Clouded, light rain.
20	43.0	37.0	40.0	Rained steadily all night & today.
21	53.0	40.0	46.5	Steady rain for last 24 hours.
22	68.0	42.5	55.3	Clouded to clear.
23	72.0	33.0	52.5	Clear, windy.
24	77.0	34.0	55.5	Clear to overcast, sultry.
25	85.0	38.5	61.8	Clear, high clouds.
26	90.5	39.0	64.8	Clear
27	98.5	44.5	71.5	Clear to sultry, showers.
28	92.0	48.0	70.0	Very sultry, heavy thunderstorm in evening.
29	97.0	50.5	73.8	High clouds.
30	97.0	52.0	74.5	Clear, sultry.
31	89.0	56.0	72.5	Clouded, sultry.
June				
1	83.5	56.0	69.8	Sultry.
2	57.0	44.0	50.5	Heavy clouds.
3	55.5	40.0	47.8	Heavy clouds, windy.
4	75.0	43.5	59.3	Cloudy, some sunshine
5	76.0	41.5	58.8	Cloudy, heavy rain p.m.
6	60.0	38.5	49.3	Rain all night
7	50.0	40.0	45.0	Rain
8	58.0	40.5	49.3	Rain
9	70.0	40.0	55.0	Heavy clouds, windy
10	75.5	36.5	56.0	High clouds
11	74.0	44.5	59.3	Clouded, sultry
12	71.0	52.0	61.5	Rain last night; clouded, windy.
13	82.5	33.0	57.8	High clouds, windy.
14	85.0	47.5	66.3	Overcast, sultry, rain in morning
15	72.0	47.5	59.8	Clouded, rains.
16	70.5	37.5	54.0	Clouded, light rains.
17	61.5	46.5	54.0	Clouded, windy, showers.
18	65.5	42.5	54.0	Clouded, windy.
19	75.0	34.5	54.8	High clouds.
20	86.0	34.5	60.3	High clouds
21	87.0	41.5	64.3	Clear
22	97.0	48.0	72.5	Clear

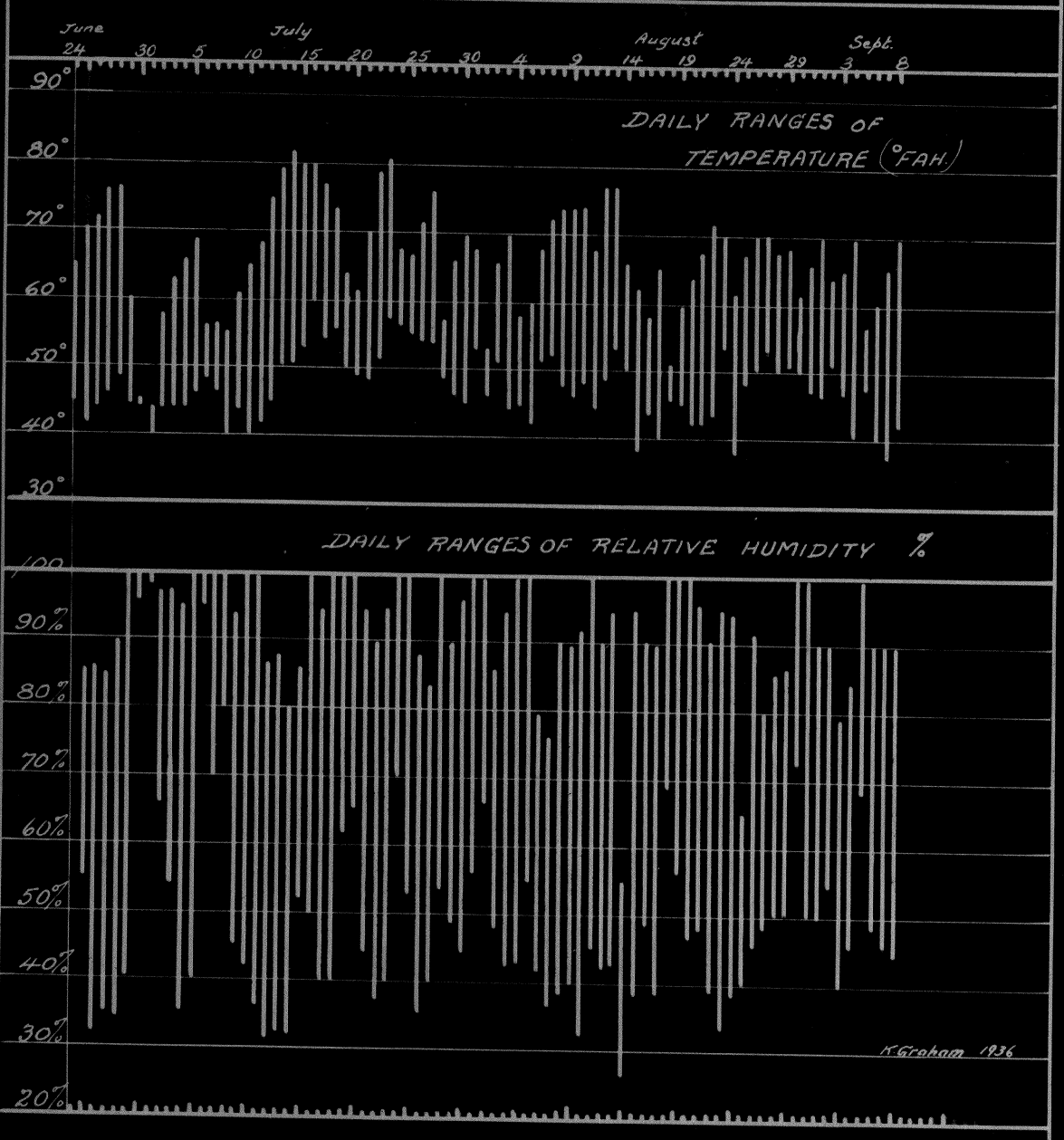
Temperature Readings (continued).

1936 June	Max.	Min.	Mean	Remarks
23	94.0	63.5	78.8	Clouded, very sultry.
24	93.5	54.0	73.8	Clear, windy
25	91.0	53.5	72.3	Clouded
26	93.5	47.5	70.5	Clouded
27	87.5	47.5	67.5	High clouds, windy
28	66.5	46.0	56.3	Clouded, windy, rain.
29	76.0	60.0	68.0	Clouded, windy
30	82.0	38.5	60.3	Clear, windy
July				
1	89.5	48.0	68.8	High clouds, windy
2	92.0	44.5	68.3	High clouds, very sultry.
3	77.0	54.5	65.8	Clouds, rain, strong south wind.
4	72.5	56.5	64.5	Clouded, windy
5	78.0	51.0	64.5	Clouded to clear
6	84.5	40.0	62.3	High clouds
7	82.5	43.5	63.0	Clouded, windy, smoky
8	77.0	39.5	58.3	Rain last night. Overcast to sunny
9	76.0	37.0	56.5	Dull
10	76.5	48.0	62.3	Rainy
11	74.5	51.5	63.0	Overcast
12	84.5	36.0	60.3	Clear
13	89.5	40.0	64.8	High clouds
14	87.0	45.5	66.3	Clear to thunderstorm and very heavy rain.
15	89.0	46.5	67.8	High clouds, smoke haze ex Flathead
16	96.0	44.5	70.3	Clear
17	94.0	48.5	71.3	High clouds, sultry
18	97.5	46.5	72.0	Clear
19	100.0	50.5	75.3	Clear
20	101.5	46.5	74.0	Clear

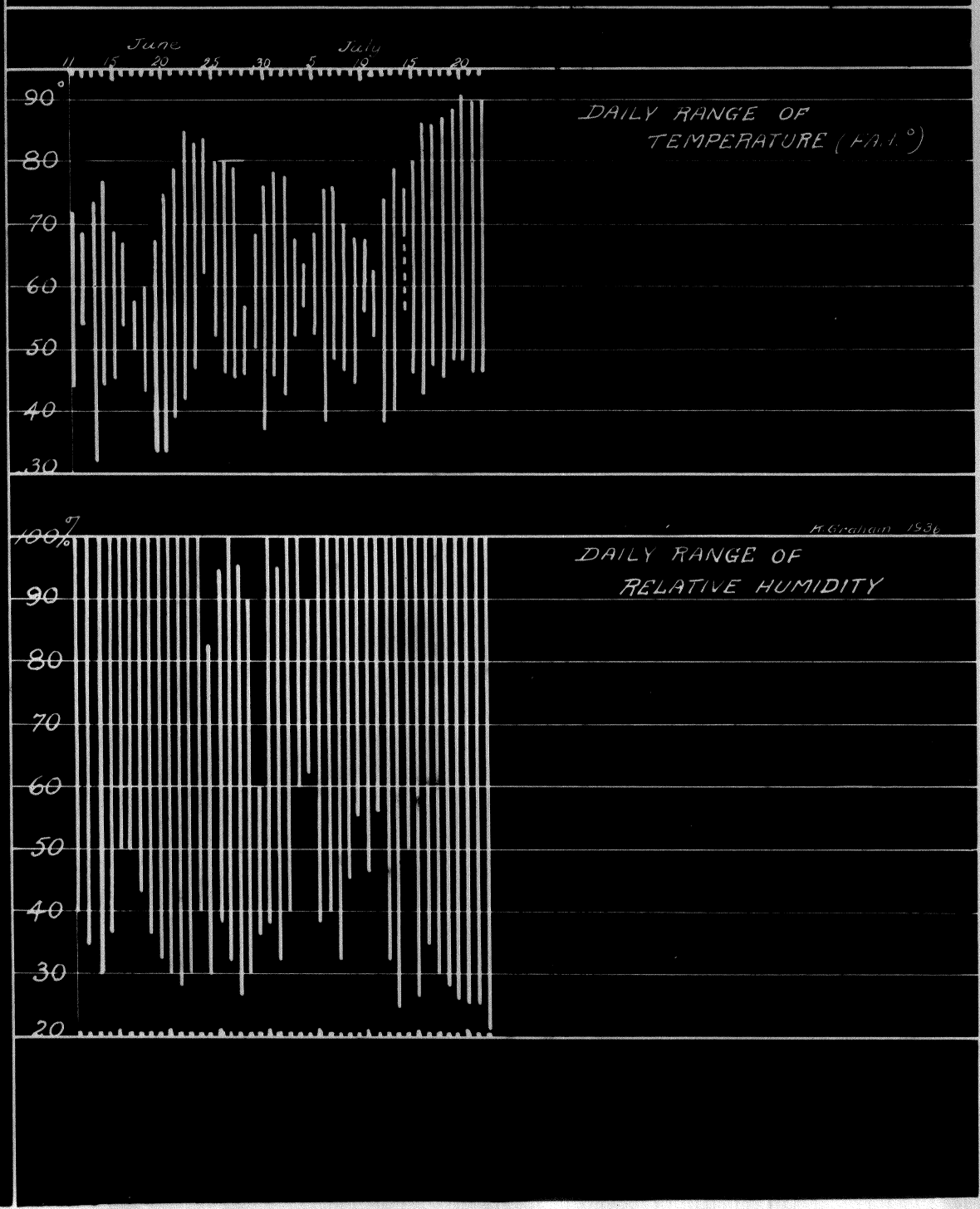
DAILY RANGES OF TEMPERATURE AT FORESTRY CABIN ON LIZARD CREEK, FERNIE, B.C., 1934.



TEMPERATURE & HUMIDITY CONDITIONS
PARASITE LIBERATION AREA, LIZARD CREEK, FERNIE, B.C. JUNE 24 – SEPT. 8, 1935.



TEMPERATURE & HUMIDITY CONDITIONS AT FERNIE FIELD STATION JUNE 11 - JULY 22, 1936



SOUTH EASTERN PORTION

KOOTENAY DISTRICT

BRITISH COLUMBIA

SCALE 7·89 MILES TO 1 INCH

RAILWAYS

HIGHWAYS

Known distribution of L. erichsonii Hartig.

● – 1936 parasite liberations M

● – 1935 parasite liberations M

○ – 1934 parasite liberations M

▲ – 1935 parasite recoveries

▲ – 1936 parasite recoveries

Western larch extends only a short distance north of this point.

Could find no evidence of larch sawfly north or west of this point

Blue European larch sawfly probably entered B.C. from the south.

Larch practically ceases east of this point

Wilderness L.

Columbia R.

Canal Flat

Kimberley

Fort Steele

St. Mary's River

Bull River

CRANBROOK

Wasa

Lumberton

Moyie Lake

Moyie

Wardner

Boswell

Kootenay Landing

Creston

Goat R.

Yahk

Kingsgate

INTERNATIONAL BOUNDARY

Newgate

UNITED STATES

Elko

Galloway

Forest Ranger's Cabin

Waldo

Gold Creek

Flathead River

Fording River

Line Cr.

Brule Cr.

Grave Cr.

Wilson Cr.

Michel

FERNIE

Hosmer

Morrissey

Coal Cr.

Corbin

ALBERTA

1936 REPORT OF

BARK BEETLE INVESTIGATIONS.

Kootenay National Park.
B. C. Spruce Mills Lumberton, B. C.
Lamb Creek Timber Limits.
Trinity Valley, B. C.
Aspen Grove, B. C.
Lambert Timber Limits.
C. P. R. Timber Limits Cherry Creek B. C.

- By -

Hector A. Richmond. Jr. Ent.

NOTE: Photographs obtained during the summer proved worthless due to the fact that all the Zeiss Ikon film packs supplied were defective. The few illustrations included were made on plates.

INDEX.

INDEX (cont.)

INDEX (cont.)

INTRODUCTION.

Bark beetle investigations for 1936 were concerned primarily with analyses of former severe infestations such as that in the Kootenay National Park, Aspen Grove etc., and in determining the status of the insect hazard to private timber holdings. Such work entailed a considerable amount of travelling and for that reason, as well as the fact that there is no increasing epidemic at present, no permanent summer camp was established. In addition to bark beetles records of other forest insects were obtained as encountered. Some of the more important ones included the brown headed budworm (Peronea variana Fern.), the brown headed spruce sawfly (Pachynematus ocreatus Marlatt), a root weevil (Hypomolyx piceus DeG.), the European larch saw fly (Lygaeonematus erichsonii Hartig) as well as secondary insect enemies and various natural enemies.

The Kootenay National Park's infestation while generally declining now extends over some 75 square miles. It has served, to a certain extent, in arousing interest in the parks to the need of further work to cope with the resultant fire hazard. The need for a definite forestry programme is evident. These aspects have been more fully discussed under the heading "Recommendations".

The Aspen Grove a rea is now practically free of beetle

activity but annual inspections should be continued and any changing conditions recorded.

There has been an increasing demand for the services of the Division of Forest Insects by private timber operators due probably to a renewed activity in logging with the return to more normal prices, and partly to the interest of the Provincial Forest Service. Selective logging in areas endangered by bark beetles, when practicable, can do much in reducing the operators loss as proven on the timber limits of the B. C. Spruce Mills. The scope of this field of work will be no doubt much broadened in the future.

Kootenay Park.
Insect Reconnaissance,
1936.

From here

by

H. A. Richmond.
Division of Forest Insects, Entomological Branch, Vernon, B. C.

A general reconnaissance of the bark beetle and other insect problems in the Kootenay National Park was conducted by the writer incompany with Mr. K. G. Graham between the dates July 6th and July 27th, 1936. This work consisted of analyzing the seven sample plots established in 1935 to ascertain as nearly as possible the general trend of the bark beetles and their natural enemies; conducting a general survey of the entire park to ascertain the spread and prevalence of bark beetles in parts remote from the main infestation at McLeod Meadows; and to check on the presence of any other insects which might endanger the timber of the park.

Summary of Information Obtained.

The following summarizes the main information obtained on this work. Complete details, tabulations etc., have been prepared separately.

I. Bark Beetles.

(a) Pines.

The bark beetle situation in the Kootenay Park shows a decline in activity in certain parts while intense activity is evidenced in other parts.

The McLeod Meadow area, which represents the most intense and one of the oldest infested areas, shows a great decline in activity. The four sample plots located in that area revealed in 1935, 86 trees dying; in 1936 there were 19 trees dying. In addition, there were 23 green trees in process of attack in 1936 which will likely not turn colour till 1937. It is surprising to note that although the casual observer would think that the majority of the timber in the McLeod Meadows vicinity is dead, such is not the case. In spite of the tremendous mortality that has occurred to the Lodgepole pine, much green timber remains. On three acres located in the most severely infested portion of this area, there has been a total of 328 trees killed, but there still remains 396 healthy green trees.

Natural enemies of the bark beetles in the form of predators and parasites have become most abundant and these, combined with climatic factors, have contributed in reducing the population and thus the destruction of the bark beetles.

Such is not the case, however, at the more northern extremity of the McLeod Meadows infestation. Two miles north of the Meadow Creek bridge on the west side of this valley the quantity of dying timber is astonishing.

Where only small isolated patches were noted last year, the entire hillside is now mottled with discoloured timber. This condition extends for a distance of perhaps one-half mile along the valley. Green timber is then encountered for a distance of some three miles when another terribly active area appears. These two active infestations constitute the main danger of green timber at the present time.

It is not possible to predict with accuracy the future trend of this infestation. A very careful examination of some of these trees showed a remarkable freedom from natural enemies. Other trees did disclose a fairly large quantity of Hymenopterous parasites, but in general the pupulation of natural enemies is decidedly light in comparison to the older infestation at McLeod Meadows. It should be noted here, however that the increase of dying timber seen this summer, represents for the most part trees attacked during July and August, 1935. The attack on new trees for 1936 was just commencing when the examination was made and hence I cannot say just how great an increase will occur during 1936. An autumn survey would reveal this more accurately.

Throughout the remainder of the park the bark beetle situation is not much changed from 1935 and one can say with a fair degree of safety that the aformentioned regions constitute the main bark beetle activity and danger zone in the Kootenay Park at present.

Major Jennings, of the Banff Park, was somewhat concerned lest the Kootenay Parks infestations should spread

into the Banff Park. This, however, is not a serious problem for the Rocky Mountains Park at the boundary is mostly small second-growth and burned-over country which would prevent any further spread of the epidemic from the Kootenay to the Banff Parks.

(b) Fir.

The activity of Bark beetles in the Douglas Fir of the park seem restricted to the south end, near Radium Hot Springs. A few scattered groups are to be seen in somewhat remote and inaccessible points along the mountain sides. These areas are small, in spite of the fact that they are several years old, and they do not represent the same hazard as the pines. One small area, adjacent to Warden Meredith's station, was examined, and due to its proximity to the road, it was considered a hazard from an aesthetic standpoint. No direct control was feasible due to the lateness of the season, for part of the beetles had already emerged and were commencing an attack on new trees. We therefore felled some of the green trees which were just being attacked, these trees being left in the woods as "trap trees" and will be burned this fall. In this manner a good percentage of the summer emergence should be absorbed in these trap trees and will be destroyed. Other trap trees will be laid down during the winter to absorb any spring emergence and will be burned next spring. Any trees still infested at that time might be cut and burned and this small infestation should be disposed of with very little expense.

The cause of this trouble is directly due to slash which was left in the woods some three years ago.

2. Black-headed Budworm.

(Peronea variana Fern.)

The Black-headed Budworm recorded by the writer last year was again checked this summer. In 1935 it was most prominent on the spruce and balsam in the vicinity of Hawk Creek. An examination this year showed its presence but in a much milder degree. Indications of it are to be seen over the northern end of the park, but it does not seem to represent any hazard to the forests. Its population seems to have declined greatly since 1935.

3. Root Feeders.

(Hypomolyx piceus DeG.)

This pest is a large weevil in the adult stage, and the larvae feed about the roots of certain coniferous trees. In the Kootenay Park it is very prevalent about the roots of the pine. This is the first record we have of the work of this root-borer, so at present we are unable to state to what extent it may be responsible for the weakening of the trees and their subsequent attack by bark-beetles. Records gathered this summer seem to indicate that it might not have been present before 1930. Of the trees killed between 1929 and 1931 which were examined, only 9 had been attacked at their roots and 22 had not. Of the 55 trees examined attacked between 1935 and 1936, 24 showed root injury and 31 did not.

Furthermore 19 green trees which had been attacked at their roots had not been infested with bark beetles. Nevertheless, the work of this root borer causes such a flow of sap that a certain weakening effect is bound to occur and when such occurs on a marginal tree it must contribute to the successful invasion of bark beetles.

4. The Brown Headed Spruce Sawfly.

(Pachynematus ocreatus) Pikonema alaskensis

This sawfly affecting spruce along the banks of the Kootenay and Vermillion Rivers was discovered, its greatest population being directly below McLeod Meadows. The larvae of this sawfly feed on new and old needles and on some small spruce they had completely stripped the tree of its foliage. The larvae were actively feeding at the time of the examination, and there were 17 larvae feeding on one small terminal. Its distribution occurred over an area 19 miles north of McLeod Meadows and 3 miles south but apart from the McLeod Meadows area, its injury was so slight that it could be found only with difficulty. No indications were found north of Hawk Creek, nor anywhere on the Bow River in the Rocky Mountains Park. A considerable amount of parasitism was evident on the larvae.

Recommendations.

In view of the destruction caused by bark beetles during the past few years, and after two seasons of careful study of conditions in the parks, several points might be suggested pertaining to this issue:

1. In spite of the heavy loss of timber much green material remains, about 50% in the areas of heaviest infestation such as McLeod Meadows. This green timber is mature Lodgepole pine and spruce, and is in sufficient quantity to lend much beauty to this country in spite of the heavy mortality encountered in the past few years. In its present condition, the quantity of standing dead timber would make fire suppression impossible but fire prevention could be attained with considerable ease. To this end, the construction of fire-guards should certainly be proceeded with. Meadow Creek which divides this area in half would seem to be the most logical route to follow for in the event of fire, this creek would supply water along the greater length of the guard. Nixon Creek is another admirably located creek for such a guard. Such fire-guards should extend from the Kootenay River to timber line.

While such work would involve a considerable expense it would be no more than would be expended in the event of a forest fire in this area. Unless the necessary measures are taken at present, this beauty spot in the Kootenay Pards is almost doomed to fire in the future. A great deal of the aesthetic value of the Kootenay Park hinges on the conservation of this timber.

2. The cutting and removal of dead timber in the infested zone would be mostadvantageous both as a fire protective measure and enhancing the beauty of the forest.

3. In line with the conservation of young growth in the beetle-killed areas of the park, there is too the building up of forests

which in future might be more resistant to insect depredations than the native pure stands. Throughout the parks there are burned-over areas much of which is becoming covered with solid stands of Lodgepole pine, typical of most burned-over country. Certain areas are growing nothing but brush.

Selective planting of mixed species, thinning of the present dense stands of reproduction and beetle-killed trees, and management aimed at the production of vigorous growth might assist greatly in avoiding a re-occurrence of the present trouble, and as well enhance the beauty of the parks.

4. The proper management and disposal of slash and cull logs wherever cutting is encountered in the parks is most vital. There is no more certain way of breeding up bark beetles than by leaving slash and cull logs in the woods. So important is this point that one private logging company have drawn up a slash disposal programme with as much care as their logging plans. They realize from past experience that slash and green timber cannot go together.

Not only must slash be burned, but burned at the right time, for otherwise the beetle population might have abandoned the slash before it is destroyed.

5. Direct control of the present active region, north of McLeod Meadows, might be advantageous in the spring of 1937. By this system, trees containing live bark beetles and their progeny are cut and burned prior to any emergence. The advisability of such

a programme, however, needs some further study. During our observations this summer, as already noted, the new attack was just commencing. How much timber would need to be so handled could be ascertained only at a later date. Furthermore, the exact extent of these active infestations should be chained off so that a fairly definite idea could be gained as to their area and accessibility. Further observations into the question of parasites and predators in this region might be advantageous before any definite opinion could be made. From this season's observations, however, the question of spring control work in that area should be seriously considered.

Bark Beetle

Reconnaissance Work.

The tendencies of the main infestation are revealed in the sample plot records. Four plots, each of one acre in size, were established in 1935, located in the most active infested region. These were plots 1, 2, 3 and 7. By reference to the table on page 14 it will be evident how greatly the infestation has decreased in the McLeod Meadow vicinity. In the first three plots, there was a total of 755 Lodgepole pine, of which 241 were infested prior to 1934; 74 infested during 1934; 13 during 1935 and 17 infested in 1936, None of ~~which~~ the latter have yet died. In these 3 acres there still remain 410 green trees. Though to a casual observer it might appear as though all the timber was dead, such is not the case and what remains certainly warrants protection.

In addition to sample plots all the territory was examined and the general tendencies of the epidemic checked. These are summarized below.

Point 1. (2 miles north of Meadow Creek Bridge at road culvert just north of deserted cabins, looking west).

1935 condition: "Majority of this timber green with small isolated infested patches scattered along hillside. Largest patch with about fifty trees, others smaller, 10 to 25 trees."

1936 condition: "This hillside shows a tremendous increase. The entire stand shows areas of dying trees, the patches of last year have joined with each other and the number of dying trees is too great to count. This area is for the most part new infestation within the past two years.

Point 2. (Same location, looking east across Kootenay River).

1935 condition: 7 compact infested patches with scattered infested areas just north of this. This latter extends along bottom of valley.

1936 condition: Little changed. Only a distant view is to be obtained but there is no indication of much spread nor freshly-dying trees.

Point 3. (3.7 miles north of Meadow Creek Bridge, at bend of road betwenn road signs "Mt. Selkirk" and "Mt. Doer" looking down road).

1935 condition: The hillside thus seen is a continuation of the timber seen from Point 1. Only one patch of infested timber is to be seen and this extends from the brow of the hill down to a point where the tips of those trees bordering the road cut the line of sight between the observer and the lower extremity of the infested patch.

1936 condition: The spread of this infestation is much the same as that recorded under Point 1, as these two areas are contiguous with one another. The infestation has spread considerably, chiefly to the south (left) and the infested

timber joins with that seen from Point 1. It also spreads downhill and north slightly. This area has been decidedly active during the past year.

Point 4. (At base of fire look-out tower, 1 mile south of Dollyvarden Creek, looking west).

1935 condition: Practically all of this timber is green except at the north end where a few patches of infested timber occur. A few infested trees are also seen along the margin of the road directly in front of this tower.

1936 condition: The north end of this stand has increased to cover an area fully double in size to that seen in 1935. The infested trees along the margin of the road are doubled in number. The timber covering the majority of this slope is green, however.

Point 5. (Same location as Point 4, looking east across Kootenay River).

1935 condition: A scattered infestation covers the whole of the eastern side of this valley, except that timber adjacent to the river.

1936 condition: This infestation remains much the same as in 1935. No newly turned trees are to be seen, and since this is one of the older infested areas it is probably dying out in a manner similar to McLeod Meadows.

Point 6. (Dollyvarden Creek to Kootenay Crossing).

1935 Condition: This stand is chiefly young healthy Lodgepole with only one group of about thirty trees infested beside the warden's station. The east side of the valley is burned off.

1936 condition: An occasional infested tree is to be seen along the roadside but there does not seem to be any increase of the infested patch at the warden's cabin.

Point 7. (13.4 miles north of Meadow Creek bridge at "curve" sign on righthand side of road; looking right beyond old burn of 1926).

1935 condition: A few infested patches, 15 to 40 trees each, and two small infested groups just below road grade are to be seen.

1936 condition: No noticeable activity is ~~apparent~~ apparent at the time of examination.

Point 8. (16.4 miles north of Meadow Creek Bridge at road sign "35").

1935 condition: To east are seven scattered groups of infested trees, thirty to seventy trees each. Patches higher up mountain-side of three to four trees each.

1936 condition: Practically no change except the appearance of a new small patch above the river bank on the right hand side of the draw.

Point 9. (Simpson's Monument 19.7 miles north of McLeod Meadows) and

Point 10: (22.3 miles north of McLeod Meadows beside sign "Mt. Assiniboine Alt. 11,870').

These two points cover the east side of the valley from Simpson's pass to Vermillion Crossing.

1935 condition: All this area is covered with patchy infested areas of 1 to 10 trees.

1936 condition: Much the same, brown timber being very noticeable, but no indications of newly-turned trees. This area appears inactive.

The seven sample plots established in 1935 were again examined this year. These plots were each one acre in extent. The accompanying tabulations (Pages17-39) show the locations and conditions of these plots, but they are summarized below.

Plot 1.

Total number of trees on plot	192
Trees killed before 1935 - - - - 83	
Trees discoloring in 1935- - - - 64	
Trees discoloring in 1936- - - - 5	
Total number killed by 1936	152
Trees attacked since 1934 but recovered - - - 6	
Trees yet uninfested - - - - - - 25	
Trees being attacked in 1936 - - 9	
Total number green trees on plot	40

Plot 2.

Total number trees on plot	227
Trees killed before 1935 - - - -79	
Trees discoloring in 1935- - - - 5	
Trees discoloring in 1936- - - - 4	
Total trees killed by 1936	88
Trees attacked since 1934 & recovered - - - - 6	
Trees yet uninfested - - - - - -29	
Trees being attacked in 1936 - - 4	
Total number green trees on plot - -	139

Plot 3.

Total number trees on plot	336
Trees killed before 1935 - - - 79	
Trees discoloring in 1936 - - - 5	
Trees discoloring in 1936 - - - 4	
Total number killed by 1936	88
Trees attacked since 1934 but recovered - - - 2	
Trees yet uninfested - - - - -242	
Trees being attacked in 1936 - 4	
Total number green trees on plot	248

Plot 4.

Infested trees prior to 1936 - - - -	3
Infested during 1936 - - - - - - - -	0

Plot 5.

Infested trees prior to 1936 - - - 5
Infested trees during 1936 - - - - 0

Plot 6.

Infested trees prior to 1936 - - - 3
Infested during 1936 - - - --- - - 4

Plot 7.

Total number live trees on plot in 1934	122
Discolored during 1935 - - - -12	
Discoloring during 1936- - - - 6	
Total number trees killed 1935 and 1936	18
Trees attacked since 1934 & recovered - - - - -10	
Trees yet uninfested - - - - -88	
Trees being attacked during 1936 - - - - - 6	
Total number green trees on plot	104

The foregoing summaries may be further compared as follows:--

Plot No.	Total Trees	Trees Infested				Not infested, 1936
		Up to 1934	1934-35	1935-36	1936	
1	192	83	64	5	9	31
2	227	79	5	4	4	135
3	336	79	5	4	4	244
4			3	0	0	
5			5	0	0	
6			3	4	0	
7	122		10	6	5	101

Plots 4, 5 and 6 are of the same area as the others, namely 1 acre, but are situated on the extremities of the infestation, and when located in 1935 practically all trees on them were green. Trees infested at that time were numbered (Column "1934-35") and any additional infested trees in 1936 were again numbered.

The other plots, numbers 1, 2 3 and 7 show a very light infestation during the past two years. These four plots are located through the main infested area and there is little doubt that the main epidemic area is becoming less active as time goes on. Plot No. 1 shows this in a more extreme manner than the others, for in 1935 there were 64 trees turning

yellow (infested probably in 1934); in 1936, five trees were turning yellow, with an additional nine trees (green) actively infested in 1936.

It should be noted, however, that these plots do not tell the whole story. Plot 5, located five miles north of the main infestation and far removed from the greatest activity shows no dying trees this year (attacked 1935) and no trees newly attacked in 1936, but at the same time there were ten infested trees just outside the n.e. corner of the plot. Furthermore, on the hillside about ½ mile above plot 6 a tremendous increase in infested trees has occurred, although the same degree of increase has not occurred in Plot 6.

While the general trend of beetle activity in the McLeod Meadow area is shown fairly well in the sample plot studies, the beetle activity beyond this area can be ascertained only by making a general reconnaissance. The activity at the north end, two miles north of McLeod Meadows, is explained under the heading "Reconnaissance," ~~Page~~

Sample Plot 1.

Location: 0.2 miles south of Meadow Creek Bridge, marked by two white corner stakes, the line joining them running S 30°E.

Tree Species: Lodgepole pine.

Tree Numbers: 1 to 192.

Plot Established 1935. Current examination July 9, 1936.

Abbreviations used:

G - Tree green and alive.
D - Tree dead. Foliage brown or absent.

T - Tree infested and foliage turning colour.

Dm. - Dendroctonus monticolae.

I - Ips.

/30 /31 etc. Indicates year tree was infested.

Tree No.	D.B.H.	History of Bark Beetle Activity			Hypomolyx activity.
		1934	1935	1936	
1	15	G	G	G	Much. Encircles base
2	16	G. Dm.	G.Attack drowned out.	G	Spot, east side.
3	8	D/34	D	D	
4	14	G.Dm.	T	D	
5	4	D/31	D	D	
6	16	D/31	D	D	
7	12	D/31	D	D	Spots on e. & w.
8	6	D/31	D	D	
9	4	D/31	D	D	
10	10	D/31	D	D	
11	8	D/31	D	D	None

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
12	12	D/30	D	D	
13	12	G Dm.	T. Ips	D.	
14	18	D/31	D	D	
15	18	G Dm. & Ips	T	D	
16	10	D /29	D	D	
17	20	G Dm.	T	D	
18	20	D /30	D	D	
19	18	D /31	D	D	Spot on w.
20	16	G Dm.	T	D	
21	14	G Dm. & Ips.	T	D	
22	14	G Dm.	T	D	
23	10	G Dm.	T	D	
24	16	G	G	G	Spruce
25	12	D /31	D	D	
26	12	D /31	D	D	
27	17	D /30	D	D	
28	16	G Dm.	T	D	Spot on e.
29	12	G Dm. & I.	T	D	
30	12	G Dm. & I.	T	D	
31	14	D /30	D	D	None
32	14	G Dm.	T	D	Spot on w.
33	10	D /29	D	D	
34	10	D /29	D	D	
35	24	G Dm.	T	D	Spots on e.& s.
36	10	G Dm.on 1 side	G	T Ips	None
37	14	D /31	D	D	None
38	16	D /31	D	D	None
39	20	G Dm.	T	D	spots n.s. & w.
40	18	G Dm.	T	D	Encircles base
41	10	D /33	D	D	None
42	14	D /29	D	D	
43	6	D /30	D	D	
44	12	D /30	D	D	None
45	16	G Dm.	T	D	None
46	22	G Dm.	T	D	None
47	8	D /29	D	D	None
48	14	Dm. & Ips	T	D	None
49	12	D /29	D	D	Spots n. & e.
50	12	D /30	D	D	None
51	20	D /33	D	D	Little on s.
52	16	G Dm.	T	D	None
53	8	G	G	G	
54	10	G Dm.	T	D	None
55	14	G Dm.	T	D	None
56	12	G	G	G	None
57	14	G	G Dm. & Ips	G Dm. & Ips	None

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
58	14	G	G	T Ips	None
59	12	G	G	G	None
60	10	D /29	D	D	
61	20	D /31	D	D	
62	18	D /30	D	D	Little on e. & w.
63	16	D /30	D	D	Little on n.e.
64	12	D /29	D	D	None
65	14	D /30	D	D	1 root on s.w.
66	14	G Dm.	T	D	None
67	12	G Dm.	T	D	None
68	10	G Dm.	T	D	1 root on E.
69	12	G Dm.	T	D	None
70	10	D /30	D	D	
71	8	D /30	D	D	
72	12	D /29	D	D	None
73	14	G Dm.	T	D	
74	14	D /33	D	D	None
75	10	G Dm.	G	G	None
76	12	G Ips e.side	G	T Ips	Much, 2/3rds circumference
77	12	G	G	G	
78	10	G	G	G	None
79	14	G Dm. & Ips	T	D	Much on all sides.
80	6	D /29	D	D	
81	6	D /29	D	D	
82	16	D /31	D	D	
83	12	D /30	D	D	
84	14	D Dm.	D	D	Little on s.e.
85	12	G Dm.& Ips	G Ips	T Ips	Little on s.w.
86	18	G Dm. & Ips	T	D	
87	6	G	G	G	Little on n.e. Old work.
88	14	G	G	G	Little on n.e. & s.e.
89	12	G Dm. & Ips	G Ips on e.side	G Ips on e.side	Little on n.
90	10	D /31	D	D	
91	12	G	G	G	Little on e.
92	12	G Dm. & Ips	T	D	Little on s.w.
93	6	D /29	D	D	
94	14	G Dm. & Ips	T	D	Spots on n.w.
95	6	G	G	G	Spots on s.e. Old.
96	14	G Dm. & Ips	G	G	Little on s.e.
97	14	D /30	D	D	Little on s.e. & n.e.
98	16	G Dm. & Ips	T	D	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
99	16	D /30	D	D	
100	20	D /31	D	D	
101	12	G	T Dm. & Ips	D	
102	12	G Dm.	T	D	
103	12	D /30	D	D	
104	12	G	G	G	Little on e.
105	6	D /30	D	D	
106	20	D /30	D	D	None
107	14	G	G	G	Little on e.
108	14	G	G	G	None
109	6	G	G	G	None
110	22	T Dm.	D	D	None
111	8	G Ips / 30	T	D	None
112	12	G Dm. & Ips	T	D	None
113	16	D /30	D	D	
114	18	D /30	D	D	
115	14	D /30	D	D	
116	20	D /33	D	D	
117	10	G	G	G	
118	10	G	G	G	None
119	12	G Dm.	T	D	None
120	18	D /31	D	D	
121	12	G Dm.	T	D	None
122	8	D /30	D	D	None
123	10	G Dm.	T	D	2 roots, n.e. side.
124	14	G Dm.	T	D	None
125	10	G	G	G	None
126	10	D	D	D	None
127	22	D /31	D	D	
128	18	G Dm.	T	D	
129	8	G	G	G	
130	8	G Dm.	T	D	
131	12	G Dm.	T	D	None
132	12	G Dm. & Ips	T	D	None
133	14	G Dm.	T	D	
134	10	G	G Dm. Ips	G Ips on n.e.	Spot on s.w.
135	24	G Dm.	T	D	Little on w.
136	8	G Dm.	G	G Ips on n.e.	None
137	14	D /33	D	D	None
138	10	D /30	D	D	None
140	10	G	G	G	Little on s.
141	10	D /30	D	D	None
142	10	D /29	D	D	None
143	10	D /29	D	D	None
144	12	G Dm. & Ips.	T	D Ips on w.side	None

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
145	8	D /30	D	D	None
146	12	G, Dm. & Ips.	G, no activity	G, Ips w. side	None
147	10	G, Dm.	T	D	None
148	14	D /30	D	D	Little on e.
149	8	G	G, Ips & Dm.	T, Ips active, Dm. dead.	
150	10	G Dm.	G	G	Little on s.e.
151	18	G Dm.	T	D	Much on all sides
152	18	G Dm.	T	D	Spots on s.w.
153	10	D /29	D	D	None
154	16	G Dm.	T	D	None
155	12	G Dm.	T	D	
156	14	G Dm.	G	G Ips, young adults s.side	Medium amount s.e. side. Old.
157	10	D /30	D	D	
158	12	D/30	D	D	
159	12	D /30	D	D	
160	10	G	G	G	None
161	12	G	G	G	None
162	14	D /30	D	D	
163	20	D /33	D	D	None
164	12	D /30	D	D	Much, ½ base of tree.
165	14	D /30	D	D	None
166	14	G Dm.	T	D	Little on e.
167	8	G Dm.	T	D	None
168	12	G Dm.	T	D	
169	12	G Dm.	T	D	None
170	12	G Dm. & Ips	T	D	None
171	10	G Dm.	T	D	None
172	8	G Dm.	T	D	None
173	10	G Dm.	T	D	None
174	12	G Dm.	T	D	Little on s.w.
175	18	D /33	D	D	Spot n.e.
176	16	D /33	D	D	
177	22	G Dm.	T	D	Spot on e.
178	10	G Dm.	T	D	None
179	12	G Dm. & Ips.	G	G Former attack drowned out	Spots s.w.
180	14	D /32	D	D	None
181	12	G Dm.	G	G ½ side dead.	None
182	10	G Ips	T	D	None
183	10	G	G	G	None
184	6	G	G	G	1 root s. Old.
185	12	G	G	G Ips on e.side.	Little on n.e. and s.w.
186	10	G Dm.	G Ips	D	
187	10	D /30	D	D	None
188	8	D /30	D	D	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
189	20	G Dm.	G Ips on e.side	G,e.side dead,no new infestation.	Spots on e.
190	10	G Dm. & Ips.	T	D	Little H.
191	12	G	G	G	Little on n.e.
192	14	D /29	D	D	

Sample Plot 2.

Location: 0.4 miles north of Meadow Creek Bridge on east side road marked by two white corner stakes, the line joining them running E 45°W.

Tree Species: Lodgepole pine.

Tree Numbers: 193 to 425.

Plot established 1935: Current examination July 11, 1936.

Abbreviations:

G - Tree green and alive.

D - Tree dead. Foliage brown or absent.

T - Tree Infested and foliage turning colour.

Dm.-Dendroctonus monticolae.

I - Ips.

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
193	12	G	G	G	
194	10	G	G	G	
195	6	G	G	G	
196	12	G	G	G	
197	6	G	G	G	
198	10	G	G	G	
199	8	G	G	G	
200	4	G	G	G	
201	8	G	G	G	
202	8	G	G	G	
203	6	D	D	D	
204	10	G	G	G	
205	12	G	G	G	
206	10	G	G	G	
207	8	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
208	8	G	G	G	
209	12	G	G	G	
210	10	G	G	G	
211	12	G	G	G	
212	14	G	G	G	
213	10	D	D	D	
214	10	G	G	G	
215	14	G	G	G	
216	8	G	G	G	
217	10	G	G	G	
218	12	D	D	D	
219	6	D	D	D	
220	8	G	G	G	
221	12	G	G	G	
222	12	G	G	G	
223	10	D	D	D	
224	8	D	D	D	
225	8	D	D	D	
226	4	D	D	D	
227	8	D	D	D	
228	8	D	D	D	
229	8	D	D	D	
230	12	D	D	D	
231	10	G	G	G	
232	8	G	G	G	
233	10	D	D	D	
234	12	G Dm.	G	G	Infestation drowned out.
235	16	G Dm.	T	D	
236	8	D	D	D	
237	16	G Dm. & Ips.	T	D	
238	12	G Dm. & Ips	T	D	
239	14	G Dm.	G	G w.side alive.	
240	16	G Dm. & Ips	G	G	
241	10	D	D	D	
242	16	T Dm.	D	D	
243	12	G	G	G	
244	8	D	D	D	
245	8	D	D	D	
246	12	G Dm., east side	G	G Infestation drowned.	
247	10	G	G	G	
248	8	D	D	D	
249	10	D	D	D	
250	16	G	G	G	
251	14	D	D	D	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
252	12	D	D	D	
253	12	G	G Dm. & Ips	G Infestation drowned.	
254	10	G	G	G	
255	4	G	G	G	
256	8	G	G	G	
257	8	G	G	G	
258	10	G	G	G	
259	12	G	G	G	
260	8	G	G	G	
261	10	G	G	G	
262	6	G	G	I Ips	
263	12	G	G	T Ips	
264	10	G	G	G	
265	10	D	D	D	
266	10	G	G	G	
267	10	D	D	D	
268	14	G	G	G	
269	12	G	G	G	
270	8	G	G	G	
271	18	G	G	G	
272	10	G	G	G	
273	10	G	G	G	
274	10	G	G	G	
275	6	G	G	G	
276	4	G	G	G	
277	10	G	G	G	
278	10	G	G	G	
279	10	D	D	D	
280	10	D	D	D	
281	5	D	D	D	
282	8	D	D	D	
283	8	G	G	G	
284	8	G	G	G	
285	12	G	G	G	
286	6	D	D	D	
287	10	G	G	G	
288	12	G	G	G	
289	6	G	G	G	
290	8	D	D	D	
291	10	G	G	G	
292	12	G	G	G	
293	10	G	G	G	
294	10	G	G	G	
297	8	D	D	D	
298	12	G	G	G	
299	12	G	G	G	
300	6	D	D	D	
301	8	G	G	G	
302	10	G	G	G	
303	10	D	D	D	
304	6	D	D	D	
305	10	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
306	8	G	G	G	
307	6	D	D	D	
308	8	D	D	D	
309	10	G	G	G	
310	14	G	G	G	
311	10	G	G	G	
312	12	D	D	D	
313	10	G	G	G	
314	10	G	G	G	
315	10	D	D	D	
316	10	G	G	G	
317	10	D	D	D	
318	8	D	D	D	
319	10	G	G	G	
320	12	G	G	G	
321	8	G	G	G	
322	10	G	G	G	
323	8	G	G	G	
324	8	G	G	G	
325	12	G	G	G	
326	6	D	D	D	
327	12	D	D	D	
328	10	D	D	D	
329	12	D	D	D	
330	12	D	D	D	
331	10	G	G	G	
332	12	G	G	G	
333	12	G	G	G	
334	8	G	G	G	
335	12	D	D	D	
336	12	G	G	G	
337	14	G	G	G	
338	14	G	G	G	
339	10	D	D	D	
340	12	D	D	D	
341	12	D	D	D	
342	12	D	D	D	
343	10	D	D	D	
344	12	D	D	D	
345	14	G	G	G	
346	14	G	G	G	
347	6	G	G	G	
348	6	D	D	D	
349	8	G	G	G	
350	10	G	G	G	
351	10	G	G	T	Ips
352	8	G	G	G	
353	10	G	G	G	
354	10	G	G	G	
355	6	D	D	D	
356	14	G	G	G	Ips
357	10	G	G	G	
358	12	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
359	12	G	G	G	
360	6	G	G	G	
361	12	G	G	G	
362	10	G	G	G	
363	10	G	T Ips	D	
364	10	G	G	G Dm.	
365	8	G	G	G	
366	6	G	G	G	
367	14	G	G	G	
368	16	G	G	G	
369	16	G	G	G	
370	14	G	G	G	
371	12	D	D	D	
372	10	D	D	D	
373	14	G	G	G	
374	14	G	G	G	
375	8	D	D	D	
376	10	D	D	D	
377	14	G	G	G	
378	14	G	G	G	
379	18	G	G	G	
380	10	G	G	G	
381	12	D	D	D	
382	12	D	D	D	
383	8	G	G	G	
384	12	D	D	D	
385	12	G	G	G	
386	8	D	D	D	
387	6	D	D	D	
388	8	D	D	D	
389	8	D	D	D	
390	8	D	D	D	
391	10	G	G	G	
392	12	D	D	D	
393	8	D	D	D	
394	12	G Dm.	G	G	infestation drowned.
395	8	G	G	G	
396	12	G	G	G	
397	14	G	G Dm.	G	infestation drowned.
398	10	D	D	D	
399	14	D	D	D	
400	10	D	D	D	
401	14	D	D	D	
402	14	G	G	G	
403	14	G	G	G	
404	12	G	G	G	
405	14	G	G	G	
406	12	G	G	G	Ips on e. side.
407	10	G	G	G	
408	10	D	D	D	
409	10	D	D	D	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
410	12	G Dm. & Ips	G Ips, w. side infested.	D	
411	12	G	G	D	Ips numerous. Dm.
412	6	D	D	D	
413	12	D	D	D	
414	16	D	D	D	
415	12	G	G	D	Ips numerous.
416	14	G	G	T	Ips numerous
417	8	D	D	D	
418	14	G	T Ips	D	
419	16	G	G	G	
420	10	D	D	D	
422	8	D	D	D	
423	14	G	G	G	
424	8	G	G	G	
425	16	G	G	G	

Sample Plot 3.

Location: 0.9 miles north of Meadow Creek Bridge on east side of road, marked by two white corner stakes.

Tree Species: Lodgepole pine.

Tree Numbers: 426 to 762.

Plot established 1935. Current examination July 12, 1936.

Abbreviations used:

G: Tree green and alive.

D: Tree dead. Foliage brown or absent.

T: Tree infested and foliage turning colour.

Dm: Dendroctonus monticolae.

I: Ips.

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
426	14	G	G	G	
427	12	G	G	G	
428	12	G	G	G	
429	12	G	G	G	
430	8	G	G	G	
431	10	D	D	D	
432	10	D	D	D	
433	8	G	G	G	
434	6	D	D	D	
435	6	G	G	G	
436	10	G	G	G	
437	20	G	G	G	
438	14	G	G	G	
439	12	G	G	G	
440	18	G	G	G	
441	14	G	G	G	
442	10	G	G	G	
443	6	D	D	D	
444	6	G	G	G	
445	6	D	D	D	
446	18	G	G	G	
447	12	G	G	G	
448	10	D	D	D	
449	10	D	D	D	
450	10	D	D	D	
451	10	G	G	G	
452	12	G	G	G	
453	10	G	G	G	
454	10	G	G	G	
455	10	D	D	D	
456	12	D	D	D	
457	6	D	D	D	
458	10	G	G	G	
459	8	G	G	G	
460	12	G	G	G	
461	4	D	D	D	
462	8	G	G	G	
463	6	D	D	D	
464	12	G	G	G	
465	8	G	G	G	
466	8	D	D	D	
467	4	D	D	D	
468	6	D	D	D	
469	8	G	G	G	
470	12	G	G	G	
471	12	G	G	G	
472	8	G	G	G	
473	12	G	G	G	
474	8	G	G	G	
475	12	G	G	G	
476	10	G	G	G	
477	6	D	D	D	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
478	8	D	D	D	
479	10	G	G	G	
480	4	D	D	D	
481	8	G	G	G	
482	8	G	G	G	
483	8	G	G	G	
484	4	D	D	D	
485	8	G	G	G	
486	8	G	G	G	
487	14	D	D	D	
488	14	G	G	G	
489	8	G	G	G	
490	10	G	G	G	
491	10	G	G	G	
492	10	G	G	G	
493	8	G	G	G	
494	10	G	G	G	
495	10	D	D	D	
496	10	G	G	G	
497	8	D	D	D	
498	16	G Dm.	G	G	Infestation drowned out.
499	16	G	G	G	
500	10	G	G	G	
501	6	D	D	D	
502	10	G	G	G	
503	12	G	G	G	
504	10	G	G	G	
505	8	G	G	G	
506	10	G	G	G	
507	6	D	D	D	
508	12	G	G	G	
509	12	G	G	G	
510	8	G	G	G	
511	10	G	G Dm.	G	Ips. Attack only on n.e.side.
512	10	G	G	G	
513	10	G	G	G	
514	12	G	G	G	
515	12	G	G	G	
516	8	D	D	D	
517	14	G	G	G	
518	14	G	G	G	
519	14	G	G	G	
520	10	G	G	G	
521	12	G	G	G	
522	12	G	G	G	
523	14	G	G Dm.	T	Ips, Dm.larvae dead. Ips active.

Tree No.	D.B.H.	History of Bark Beetle Activity			Hypomolyx Activity
		1934	1935	1936	
524	10	G	G Dm.	T	Ips active. Dm.larvae died.
525	12	G	G Dm.	T	Ips active. Dm. larvae died
526	8	D	D	D	
527	10	G	G	G	
528	12	G Dm.	G	G	attackd rowned out.
529	12	G Dm.	T	D	
530	14	G	G	G	
531	12	G	G	G	
532	10	G	G	G	
533	12	G	G	G	
534	12	G	G	G	
535	10	G	G	G	
536	6	G	G	G	
537	8	G	G	G	
538	14	G	G	G	
539	12	G	G	G	Dm. & Ips attacking.
540	10	G	G	G	Ips & Dm. Ips Y.A.present
541	12	G	G	T	Ips & Dm. Ips Y.A.present.
542	12	G	G	G	
543	12	G	G	G	
544	8	G	G	G	
545	12	G	G	G	
546	8	D	D	D	
547	12	G	G	G	
548	10	G	G	G	
549	16	G	G	G	
550	16	G	G	G	
551	10	G	G	G	
552	12	G	G	G	
553	6	G	G	G	
554	8	G	G	G	
555	10	D	D	D	
556	8	D	D	D	
557	8	D	D	D	
558	6	D	D	D	
559	12	G	G	G	
560	6	D	D	D	
561	6	D	D	D	
562	14	G	G	G	
563	8	G	G	G	
564	12	G	G	G	
565	8	G	G	G	
566	14	G	G	G	
567	8	G	G	G	
568	16	G	G	G	
569	8	G	G	G	
570	8	G	G	G	
571	10	G	G	G	
572	8	D	D	D	
573	12	G	G	G	
574	8	G	G	G	
575	10	G	G	G	
576	12	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
577	10	G	G	G	
578	12	G	G	G	
579	8	G	G	G	
580	8	D	D	D	
581	10	G	G	G	
582	10	D	D	D	
583	10	G	G	G	
584	12	G	G	G	
585	12	G	G	G	
586	12	G	G	G	
587	14	G	G	G	
588	12	G	G	G	
589	4	D	D	D	
590	14	G	G	G	
591	10	G	G	G	
592	8	G	G	G	
593	12	G	G	G	
594	6	G	G	G	
595	8	G	G	G	
596	8	G	G	G	
597	10	G	G	G	
598	8	G	G	G	
599	8	G	G	G	
600	10	G	G	G	
601	12	G	G	G	
602	8	G	G	G	
603	10	G	G	G	
604	6	D	D	D	
605	10		G	G	
606	10	D	D	D	
607	12	D	D	D	
608	10	D	D	D	
609	10	D	D	D	
610	14	D	D	D	
611	6	D	D	D	
612	12	G Dm.& Ips.	T Dm. & Ips.	D	
613	8	G	G	G	
614	8	G	G	G	
615	6	G	G	G	
616	4	D	D	D	
617	4	G	T Ips.	D	
618	6	D	D	D	
619	8	G	G	G	
620	10	G	G	G	
621	8	D	D	D	
622	8	G	G	G	
623	6	G	G	G	
624	8	D	D	D	
625	10	T Ips.	D	D	
626	10	G	G	G	
627	8	D	D	D	
628	10	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity			Hypomolyx Activity
		1934	1935	1936	
629	10	G	G	G	
630	12	G	G	G	
631	12	G	G	G	
632	8	D	D	D	
633	8	G	G	G	
634	8	G	G	G	
635	12	G	G	G	
636	14	D	D	D	
637	12	G	G	G	
638	8	G	G	G	
639	14	G	G	G	
640	10	G	G	G	
641	8	G	G	G	
642	8	D	D	D	
643	8	D	D	D	
644	14	G	G	G	
645	10	D	D	D	
646	14	G	G	G	
647	12	G	G	G	
648	12	G	G	G	
649	4	G	G	G	
650	8	D	D	D	
651	12	G	G	G	
652	14	G	G	G	
653	14	G	G	G	
654	18	G	G	G	
655	12	G	G	G	
656	6	D	D	D	
657	10	G	G	G	
658	10	G	G	G	
659	10	G	G	G	
660	10	G	G	G	
661	10	G	G	G	
662	4	G	G	G	
663	12	G	G	G	
664	8	D	D	D	
665	12	G	G	G	
666	8	G	G	G	
667	16	G	G	G	
668	10	G	G	G	
669	10	G	G	G	
670	10	G	G	G	
671	8	G	G	G	
672	8	D	D	D	
673	12	G	G	G	
674	8	G	G	G	
675	8	G	G	G	
676	8	G	G	G	
677	10	G	G	G	
678	10	G	G	G	
679	6	D	D	D	
680	10	G	G	G	
681	8	D	D	D	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
682	6	D	D	D	
683	12	G	G	G	
684	14	G	G	G	
685	8	G	G	G	
686	12	G	G	G	
687	14	G	G	G	
688	10	D	D	D	
689	12	G	G	G	
690	10	G	G	G	
691	10	G	G	G	
692	10	D	D	D	
693	4	G	G	G	
694	12	G	G	G	
695	10	G	G	G	
696	8	D	D	D	
697	6	D	D	D	
698	12	G	G	G	
699	14	G	G	G	
700	12	G	G	G	
701	10	D	D	D	
702	12	G	G	G	
703	12	G	G	G	
704	14	G	G	G	
705	12	G	G	G	
706	12	G	G	G	
707	10	D	D	D	
708	12	G	G	G	
709	12	G	G	G	
710	10	G	G	G	
711	12	G	G	G	
712	10	G	G	G	
713	10	G	G	G	
714	10	D	D	D	
715	6	D	D	D	
716	12	D	D	D	
717	12	G	G	G	
718	8	G	G	G	
719	10	G	G	G	
720	12	G	G	G	
721	12	G	G	G	
722	10	G	G	G	
723	12	G	G	G	
724	10	G	G	G	
725	12	G	G	G	
726	10	G	G	G	
727	16	G	G	G	
728	12	G	G	G	
729	16	G	G	G	
730	12	G	G	G	
731	10	G	G	G	
732	12	G	G	G	
733	12	G	G	G	
734	10	D	D	D	
735	10	G	G	G	

Ips Active on s.e. side.

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
736	8	G Ips	T Ips	D	
737	8	G	G	G	
738	4	G	G	G	
739	6	D	D	D	
740	8	G	G	G	
741	12	G	G	G	
742	12	G	G	G	
743	8	D	D	D	
744	8	D	D	D	
745	12	G	G	G	
746	12	G Dm. & Ips	T	D	
747	12	D	D	D	
748	8	D	D	D	
749	12	G	G	G	
750	12	G	G	G	
751	12	G	G	G	
752	12	G	G	G	
753	10	G	G	G	
754	12	G	G	G	
755	6	D	D	D	
756	12	G	G	G	
757	10	G	G	G	
758	14	G	G	G	
759	12	G	G	G	
760	10	G	G	G	
761	8	G	G	G	
762	6	D	D	D	

Sample Plot 4.

Location: 4.0 miles north of Meadow Creek Bridge on east side of road.

This plot is located in an area near the northern extremity of the main McLeod Meadows infestation. Practically all trees on it were green. When established in 1935 only those trees infested were numbered, there being but three such trees. No new trees had been attacked in 1936. These trees attacked in 1935 were:

Nos. 764, 765, 766.

Sample Plot 5.

Location: 5.1 miles north of Meadow Creek Bridge on east side of road.

Like Plot 4, this plot ie beyond the main McLeod Meadow infestation. Practically all trees on it were green when established in 1935. Only infested trees were tagged and when examined in 1936 no new infestation had occurred. Trees attacked in 1935 were numbered as follows:

768, 769, 770, 771, 772.

Sample Plot 6.

Location: 3.6 miles north of Meadow Creek. Bridge on west side of road. South line runs N 80°W. S.E. corner is "Mt. Selkirk" sign.

Abbreviations used: Same as Plot 1.

Tree No.	D.B.H.	History of Bark Beetle Activity			Hypomolyx Activity
		1934	1935	1936	
774	12	G Dm.	T	D	
775	12	G Dm.	T	D	
776	10	G Ips	T	D	
902	12	G	G	T Dm. Ips	
903	12	G	G	G Dm. Ips.	
904	12	G	G	T Dm. & Ips.	
905	6	G	G	T Dm. & Ips.	

Sample Plot 7.

Location: 1.5 miles south of Meadow Creek Bridge. S.E. corner opposite "Mile 75." In stand of timber similar to Plots 1 and 2 and was established as a check against Plots 1 and 2. Established in 1935 when trees killed prior to that year were blazed but not tagged. Trees attacked since 1934 were tagged as were those which were still green. The tabulation therefore shows only green trees and those actively infested. Old dead trees were not recorded.

Tree Numbers: 778 to 901.

Abbreviations Used:

G - Tree green and alive.

T - Tree infested and beginning to discolour.

D - Tree dead. Foliage brown or absent.

Dm. - Dendroctonus monticolae.

I - Ips.

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
778	12	G Dm.	G	G Dm. drowned out.	
779	8	G	G	G	
780	12	G Dm.	T Ips	D	
781	12	G Dm.	G	T Ips active.	
782	8	G Dm.	G	T Ips active.	
783	12	G Dm.	G	T Ips active	
784	10	G	G	G	
785	14	G	G	G	
786	14	G	G	G	
787	14	G Dm.	G Ips on e. side	G	
788	12	G	G	G	
789	10	G	G	G	
790	12	G	G	G	
791	8	G	G	G	
792	10	G Dm.	G	G attack d rowned out.	
793	8	G Dm.	G Ips	G Attack on e.side only. Dm. drowned out.	
794	10	G Dm. & Ips.	T Ips	D	
795	8	G	G Ips	T	
796	12	G Dm.	G Dm.	G Dm.drowned out.	
797	6	G Dm.	G	G	
798	8	G Dm.	G	G	
799	10	G	G	G	
800	8	G Dm.	G	G attack d rowned out.	
801	14	G Dm.	G	G e.side dead, larvae dead.	
802	12	G	G	G	
803	missing.				
804	10	G	G	G	
805	10	G	G	G	
806	12	G	G	G	
807	12	G	G	G	
808	10	G	G	G	
809	10	G	G	G	
810	12	G	G	G	
811	14	G Dm. & Ips.	T Ips active, Dm.dead.	D	
812	10	G	G Ips	G Ips dead.	
813	16	G Dm.on e.side.	T Ips on w. side	D	
814	10	G	G	G	
815	10	G	G	G	
816	16	G	G Dm. & Ips.	D	
817	8	G	G	G	
818	10	G	G	G	
819	12	G	G	G	
820	8	G	G	G	
821	10	G	G	G	
822	10	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
823	10	G	G Ips & Dm.	G Y.A.of Ips present. Dm. dead	
824	10	G	G Dm.	G Dm.drowned out.	
825	8	G	G	G	
826	10	G	G	G	
827	10	G	G	G	
828	8	G	G	G	
829	8	G	G	G	
830	10	G	G	G	
831	10	G	G	G	
832	10	G	G	G	
833	8	G	G	G	
834	10	G	G	G	
835	10	G	G	G	
836	10	G	G	G	
837	12	G Dm. & Ips.	T Ips active, Dm.dead.	D Ips Y.A.	
838	12	G Dm.	G	G Dm.drowned out.	
839	12	-	-	-	
840	12	G Dm.	G Ips	T Ips active.	
841	12	G Dm.on e side.	G Ips	T Ips active, Dm.galleries.	
842	6	G	G	G	
843	8	G	G	G	
844	10	G	G Dm.	G Dm.drowned out.	
845	10	G	G	G	
846	10	G	G Dm. & Ips.	G Ips pupae on e. side.	
847	10	G dm. & Ips.	G	G	
848	8	G Dm. & Ips	T	D	
849	10	G	G	G	
850	10	G	G	G	
851	10	G Dm.	G	G Dm.drowned out.	
852	10	G	G	G	
853	8	G	G	G	
854	10	G	G	G	
855	8	G	G	G	
856	12	G	G	G	
857	8	G	G	G	
858	10	G Dm.& Ips.	T	D	
859	14	G Dm.	T	D Ips Y.A. Dm. dead.	
860	10	G	G	G	
861	14	G Dm. & Ips on e.side.	T Dm.dead, Ips,Y.A.	D	
862	10	G	T Ips	D	
863	12	G	G	G	

Tree No.	D.B.H.	History of Bark Beetle Activity 1934	1935	1936	Hypomolyx Activity
864	10	G	G	G	
865	8	G	G	G	
866	8	G	G	G	
867	10	G	G	G	
868	12	G	G	G	
869	12	G	G	G	
870	14	G	G	G	
871	10	G Dm. & Ips.	T	D	
872	10	G	G	G	
873	10	G	G	G	
874	10	G	G	G	
875	12	G	G	G	
876	12	G	G	G	
877	12	G	G	G	
878	16	G	G	G	
879	10	G	G	G	
880	10	G	G	G	
881	14	G	G	G	
882	14	G	G	G	
883	16	G	G	G	
884	14	G	G	G	
885	10	G	G	G	
886	14	G	T Dm. & Ips	D Ips Y.A. numerous.	
887	10	G	G	G	
888	10	G	G	G	
889	12	G	G	G	
890	12	G Dm. & Ips on e. side.	G Dm. dead, Ips active.	G, west side still green.	
891	14	G	G	G	
892	12	G	G	G	
893	10	G	G	G	
894	12	G	G	G	
895	6	G	G	G	
896	10	G Dm. & Ips on e. side.	G	G, e. side dead, w.side green.	
897	12	G	G	G	
898	10	G	G	G	
899	12	G	G	G	
900	14	G Dm. Ips	D	D	
901	14	G	G	G	

Spruce Sawfly Reconnaissance.
(Pachynematus ocreatus)

The spruce sawfly was first discovered along the bank of the Kootenay River directly below McLeod Meadows and its injury was most severe at this point. Its presence was noticed at a point along the Kootenay River three miles south of McLeod Meadows. North of this area it was noted at Kootenay Crossing; again at a point 14.3 miles north along the Vermillion River; again 19 miles north, on the Vermillion River. With the exception of McLeod Meadow area, the defoliation caused by this sawfly was so slight it could be found only with difficulty but its presence was recorded by eventually finding live larvae.

Areas where a search was made for the sawfly but where none was located were:--Vermillion River north of the above-noted point (19 miles north of Meadow Creek Bridge), Hawk Creek, Boom Creek, Bow River Crossing (Banff Park near C.P.R.) and Bow River near Banff.

Its spread therefore seems somewhat confined in the Kootenay Park, although how far it extends down the Kootenay River beyond the Park limits is hard to say.

Black-Headed Budworm Reconnaissance.

(Peronea variana).

The Black-headed Budworm recorded last year as quite abundant at Hawk Creek and north to the Lake Louise-Banff Highway, seems less noticeable this year. The most southerly indications of it appeared along the Vermillion River 19 miles north of McLeod Meadows, but no live larvae were to be found.

The work of the Black-headed Budworm during 1936 is much lighter than in 1935. Even then, it was not severe

BIOLOGICAL NOTES.

The following biological notes were collected in the course of other field work in the Kootenay National Park. They include notes on:

The Spruce Sawfly (Pachynematus ocreatus)
Root Weevil (Hypomolyx piceus DeG.)
Egg Counts (Dendroctonus monticolae)
Bark Analysis)Pinus contorta)

From here

Spruce Sawfly.

A sawfly of the spruce ~~(undetermined)~~ Pachynematus ocreatus was discovered by Mr. K. Graham, on July 9th along the banks of the Kootenay River. This sawfly at that time was in the larval stage and was actively defoliating young spruce. Some of these small trees were practically stripped of their foliage and the worst injury was located on small islands along the river.

Feeding was prevalent on young and old needles alike, and one twig of three spikes each being about 3" in length, was host to 17 sawfly larvae. When disturbed they raised their posterior end above their thorax. Two Ichneumon parasites were found and taken on that date. Smicroplectus velox.

On July 10, 1936, 177 of these larvae were collected and placed on spruce twigs in vials of water, which in turn were standing in soil in the bottom of a box. By July 17th these larvae were dropping and entering the soil although no cocoons had yet been formed. By July 22nd all had dropped to the soil and cocoons were in the process of making. This condition was coincident with field activities for many were entering the soil along the river by July 17th.

In addition to the above collection, 38 larvae were taken on July 17 on which 49 eggs (probably Tachinid) had been laid. These were placed on twigs in a manner similar to the aforementioned larvae. The pupae of all of these were brought back to Vernon for rearing.

This sawfly while certainly destructive when numerous, has not caused any appreciable damage and only in the one place was it found in any quantity. Its distribution, however, extends for several miles along the river bank, explained in detail under the heading "Reconnaissance."

The parasite Smicroplectrus velox is reported by Mr. G. S. Walley as being, he suspects, parasitic upon Pachynematus. It is not known to attach the European Spruce sawfly which seems to be without native parasites.

Root Feeders.

Hypomolyx piceus DeG.

This root-feeding Rhynchophora was discovered in the vicinity of McLeod Meadows while searching for Clerid larvae at the base of infested Lodgepole pines. The larvae of these beetles bore through the bark of the roots and trunk just at, or below, ground level, and may extend as much as 14" below the ground level. Such work is accompanied by a tremendous flow of pitch and their activities are marked by the accumulation of this pitch, found at times almost encircling the base of the tree like a collar and as much as 6 or 8 inches through. These masses are honeycombed with tunnels, which in diameter are slightly less than a pencil. The larvae are large, up to 2.5 cm. long, white with a brown headcapsule. Their location is somewhat difficult but may be found working on live wood where the flow of pitch is the freshest. Thirty-five larvae were procured and an attempt was made to rear them through. Most of them died, however, for maintaining natural conditions is difficult in a container. They seem to require live sapwood and bark on which to feed accompanied by a copious flow of watery pitch. While larvae were found chiefly, two pupae were observed and one adult. These observations were made between July 15 and 25, 1936.

The effect of these root-borers upon the health of a green tree is still a little obscure. Further observations will be necessary to answer this accurately but some points already noted are of interest. Four green trees were noted on Sample Plot 1 which had been attacked at one time but on which no active work was in progress. There had been no infestation of these trees. Fifteen green trees showed active work at their roots but no bark-beetle attack. Of thetrees that were actively infested and turning colour during July of the current year two had been attacked at their roots and two had not been attacked. Of the old dead trees thirty had been attacked at their roots and fifty-four had not. These figures are tabulated below.

	Active Work.	Old Work.	None.
Green Trees	15	4	18
Trees Turning	2	0	2
Dead Trees		30	54

In checking on the past history of this borer, an examination was made of old dead trees as well as those recently infested. The actual date of the death of some of the older trees is only approximate, but the majority are fairly close. The dates of death were recorded in 1935. From these figures we derive the following:--

Dates of Death of Trees and Prevalence of Root Injury.

From Sample Plot 1. McLeod Meadows.

1929		1930		1931		1932	
Present	Absent	Present	Absent	Present	Absent	Present	Absent
0	6	7	13	2	3	1	2

1933		1934		1935		1936	
Present	Absent	Present	Absent	Present	Absent	Present	Absent
3	3	2	1	18	28	6	3

From this tabulation, it appears that the earlier infestation, dating before 1930, might not have been accompanied by this borer. Since the dates of death of these earlier trees is only approximate, it might be as well to average the first three together. Thus between 1929 to 1931 we find that in a total of thirty-one trees, only nine showed any root injury and twenty-two were free of root attack. During the last two years, 1935 and 1936, of the fifty-five trees which had been attacked, twenty-four showed root injury and thirty-one did not.

From this it seems evident that this bark beetle infestation has in no way been restricted to trees showing injury of their roots by this weevil. Neither have all trees with root injury been infested, for fifteen green trees were actively attacked at their roots but showed no indications of bark beetle attack, and an additional four green trees showed old past workings at their roots with no bark beetle attack.

In spite of this, there is bound to occur a certain weakening of the tree when its roots are badly damaged. In one tree, for instance, No. 140, a small amount of boring had occurred

on the south side, and directly above this the tree was being attacked by Ips. Unlike bark beetles, however, one attack by a borer does not seem to induce further attack, by others, for the majority of injury has been restricted to one area of roots. At times, however, it does encircle the entire basal portion.

In here

Bark Analysis.

Tree 411.

July 14, 1936. McLeod Meadows. Pinus contorta.

Bark Analysis.

Sample 1.

Tree 411. Pinus contorta. D.B.H. 12".

Plot 2. McLeod Meadows. July 14, 1936.

Size 8" x 22". 6' from ground. Dm.attack 1935.

No. Dendroctonus egg galleries - 11.

No. live Dendroctonus larvae - 0.

Average length larval mines, 2½ inches.

Cause of death of larvae - probably winter.

Present insect activity - Ips.

Predators present:

Dipterous larvae - 112.

Clerid larvae - 3.

Hymenopterous cocoons - 4.

Note: Dead Dendroctonus larvae were small and entire indicating death occurred at an early stage (mines averaged 2½" long) and the cause was probably winter killing.

Sample 2.

Tree 410. Pinus contorta. D.B.H. 12".

Plot 2. McLeod Meadows. July 14, 1936.

First infested fall 1934. In July 1935 the tree contained eggs and larvae of Ips but the east side was still green. July 1936 showed tree had been attacked on all sides and was dead. Examined as follows:--Size of slab 12" x 32". Basal portion of tree. No. Dendroctonus egg galleries: 8.

Lengths (cm.): 15;16;15;25;10;20;28;18.

No. larval mines: 0.

Egg deposition: Apparently nommal.

Parent beetles: Present and dead in all galleries.

Note: Egg niches, in all galleries, appeared quite normal, but no eggs had ever hatched. Dead parent beetles in all galleries, most of which had been decapitated, gives the appearance that predaceous larvae were responsible, for this is quite typical of their work. Further evidence of this is found in the presence of numerous empty pupal cases, these being identical with those of Longheae.

Sample 3.

Pinus contorta outside Plot 2. D.B.H. 12".

McLeod Meadows. July 14, 1936.

Tree just commencing to discolour.

Size of slab: 12" x 24".

No. Ips larval mines 420.

" Hymenopterous larvae: 37.

Dipterous larvae: 20.

Note: The Dipterous larvae were less abundant than usually found, but no bark beetle larvae were present in their vicinity. Hymenopterous larvae were actively feeding on Ips larvae.

Egg Gallery Analysis.

D. monticolae, McLeod Meadows, Host - Pinus contorta.
July 23 & 24, 1936.

Gall. No.	Length Cm.	Eggs Deposited	Eggs Present	Larvae		Parents Beetles.	
				Alive	Dead	Alive	Dead
1	10	63		63		2	
2	20	17	4	13		2	
3	14	26	26	-		2	
4	10	20	11	9		2	
5	14	23	23	-		2	
6	15	37	15	22		2	
7	14	20	20	-		2	
8	17	42	22	20		2	
9	6	15	15	-		2	
10	11	52	1	51		2	
11	15	48	25	23		2	
12	15	29	15	14		2	
13	30	58	-	58		2	
14	12	22	1	21		2	
15	10	21	21	-		2	
16	12	75	23	52		2	
17	8	61	6	55		2	
18	5	18	18	-		2	
19	24	46	11	35		2	
20	7	16	16	-		2	
21	10	17	17	-		2	
22	10	18	18	-		2	
23	13	16	16	-		1	
24	3	3	3	-		1	
25	11	8	8	-		2	
26	6	5	5	-		2	
27	19	17	17	-		2	
28	13	18	18	-		2	
29	10	24	14	10		2	
30	6	26	0	26		1	
31	7	24	24	-		2	
32	7	26	26	-		1	
33	11	10	10	-		1	
34	10	23	23	-		2	

Total No. galleries...34
Total Length.....405 cm.
" eggs deposited...944.
No. eggs per cm.. 2.3

Photo showing infested timber 3.7 miles north of McLeod Meadows, Kootenay National Park. Dying timber of 1935 shown in BLACK; 1936 in RED. This is the most active infestation in the park extending for some distance beyond the left margin of the photo. At the time of examination it was not possible to forecast the spread for 1936.

The views shown on the opposite page when joined end to end constitute a panoramic picture of a large stretch of timber extending along the west side of the Kootenay National park. Figures in black indicate trees which died in 1935, while the red are those of 1936.

Top picture photographed on ordingry film, bottom picture on infra-red. Both pictures taken from the same location.

Panorama of timbered slope on west side of Kootenay National Park. Photo taken from base of fire look-out tower. Showing comparison of beetle killed trees in 1936 to those of 1935.

REPORT OF INSECT RECONNAISSANCE
ON THE
MOYIE RIVER AND LAMB CREEK TIMBER HOLDINGS
OF THE
B.C. SPRUCE MILLS - LUMBERTON, B.C.

-by-

H. A. Richmond,
Division of Forest Insects,
Dominion Entomological Branch,
Vernon, B. C.

Summary.

Lumberton Area.

No bark beetle activity was noted in any standing green timber in this area.

Green trees infested Aug. 1935 at Camp 4 had been logged during the winter of 1935-36 and no further activity was noted. This was the only active area in 1935.

All beetle activity in this area was restricted entirely to slash. Slash cut during July and August 1935 showed a very light degree of infestation in June, 1936, but a considerable amount of infestation had occurred by the latter part of July, 1936. Winter cut slash, 1935-36, showed no attack in June and only a slight attack in July, 1936. Practically the only attack upon the stumps was represented by **Trypodendron**, there being scarcely any evidence of bark beetle work on the stumps.

The complete freedom from infestation in the case of many cull logs and the light degree of attack in many others would indicate that the beetle population is much below the level that the slash is capable of maintaining.

This same condition exists throughout the entire operations.

Bark analysis and egg counts indicate that a tremendous mortality occurs between the period of egg deposition in late June and the emergence of the young adults the next June, a period of one year. A mortality of some 66% was

recorded by the end of the first five weeks of the life of the larvae hatched this year. Data collected this year would indicate that this mortality would increase to about 96% by the time this brood had reached the adult stage the following spring. Whether these figures would be correct if taken over a larger series of samples does not alter the fact that a tremendous mortality is prevalent among the immature stages of these bark beetles.

The early death of the very small larvae is due, no doubt, to many factors, climatic factors probably being one of the greatest for very few natural enemies had penetrated the bark at the time of death of these immature larvae. Later mortality occurring from mid-July until June of the following year seems to be caused primarily from predators and parasites. Of these the Hymenopterous Coeloides and the Dipterous Loncheae are by far the most numerous. The former was in abundance on every infested log by mid-July and these two natural enemies are unquestionably responsible for a very heavy mortality.

The root borer Hypomolyx piceus De G., prevalent this year in the Kootenay Parks, was not recorded in the Lumberton area.

The European ~~Spruce~~ Larch Sawfly, Lygaeonematus erichsonii Hartig., recorded last year in this area, though present has caused no serious injury. It is present on the Lumberton road below Camp 3 and in the vicinity of Camp 4. Parasites (Mesoleius tenthredinis Morley) were liberated along the Lumberton road on June 22nd.

Lamb Creek.

Six days were spent in the Lamb Creek area during the latter part of June, 1936.

Bark beetle activity in this region is restricted chiefly to the lodgepole pine on the south-east side of Lamb Creek. Dendroctonus monticolae and Ips are quite active and brown patches of infested trees may be seen along the valley-side from Gene Creek to a point opposite Rabbit Foot Creek. This infestation, however, seems to be subsiding due to natural enemies prevalent.

A clump of about four pines were dying on Rabbit Foot Creek attacked in 1934 by Dendroctonus and in 1935 by Ips. Elsewhere beetle activity was restricted to windfalls. Dendroctonus engelmanni were found in windfalls throughout the area but the Braconid parasite Coeloides was much in evidence where such occurred.

An old infestation on Tate Creek had occurred some seven years previously, which resulted in a considerable loss of spruce, but this has completely died out.

An old infestation in the pine at the head of Little Lamb Creek has at one time caused considerable destruction but this too shows no signs of activity.

Scattered dead spruce throughout the Lamb Creek valley indicate the presence of Dendroctonus engelmanni which have been active over a period of years but not in an epidemic nature. In practically all of these old dead trees one can see evidence of the work of this Braconid parasite.

The European Larch Sawfly was recorded on the south-east side of Lamb Creek opposite Rabbit Foot Creek and along Little Lamb Creek. In neither case was it in an epidemic state.

Report of Bark Beetle Investigations of the Lumberton and Lamb Creek Limits of the B.C. Spruce Mills.

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by

Hector Richmond,
Junior Entomologist.

Bark beetle investigations during 1936 in the above noted areas were conducted by the writer with the assistance of Mr. K. G. Graham between the following dates: Moyie and Ridgway areas, June 12-25 inclusive, and July 28-30 inclusive; Lamb Creek June 26-July 1 inclusive.

Moyie & Ridgway Areas.

This area is the location of the present logging conducted by the B. C. Spruce Mills. It has been the seat of considerable bark beetle activity in the past from which cause this company has suffered a heavy loss. Investigations during 1935 disclosed that the most recent activity has been centred on the vicinity of Camp 4, and so this camp was selected as the most logical location from which to conduct studies in 1936.

In 1935, Camp 4 was the only area in which newly infested standing green spruce could be located, and it was suggested at that time, that as much of this timber as

possible shoudl be logged during the winter prior to the trees' death in 1936. Although not all trees were infested, Mr. Moore, the superintendent, estimated that about 9,000,000 feet were endangered. The work in 1936, therefore, included a thorough check on this area as well as studies on the future outlook of the bark beetle problem. A complete examination was made of the slash cut during the summer of 1935 and slash cut curing the winter, 1935-36, and all other logging areas were checked over.

In both the visits made, June 12-25 and July 28-30, there was a complete absence of any bark beetle activity in standing spruce. The infested trees of 1935 had been logged and no further infestation has occurred. The abundance of bark beetles in the slash, therefore, occupied most of the study.

The activity of Dendroctonus engelmanni about June 12th was confined to the summer cuttings of 1935 which had been infested by them at that time. No flight for 1936 had occurred and so the past winter's slash was free of attack. The first records procured, therefore, were centred on ascertaining what the winter's survival of larvae, pupae and yound adults had been, per square foot of bark. (Later observations were based on ascertaining the average number of eggs laid per square foot of bark and still later studies showed how great a mortality occurred to the newly hatched larvae and the prevalence of parasites).

In studying the survival of Dendroctonus from the past winter, slabs of bark were removed from infested logs and their size, numbers of egg galleries and lengths, and all living material within was recorded.

A total of 36 slabs was examined and while these are shown in detail on Pages 12 to 16 inc., they are summarized below.

	Total	Per sq. Foot
Live larvae	58	1.7
Live pupae	246	7.0
Live young adults	85	2.4
TOTAL LIVE PROGENY	389	11.1 #
Dead larvae	226	6.4
Dead pupae	89	2.5
Dead young adults	9	0.3
TOTAL DEAD PROGENY	324	9.2
Hymenopterous parasites	221	6.3
Dipterous parasites	380	11.0
Coleopterous predators	Many	
TOTAL NATURAL ENEMIES	601 -	17.3 +

Continuing these observations upon the progeny for the current year, that is, logs which were infested in the spring of 1936 and which contained young larvae by July 27, 1936, we have the following summary:--

Total bark area examined 13.5 sq. feet.

	Total	Per sq. Foot
Live larvae	1336	99.0 #
Dead larvae	137	1.1

No pupae present to date.

Natural enemies not sufficiently widespread to calculate average numbers.

The important figures in the above are marked #. Thus we see that the live progeny from the spring counts (overwintered) average 11.1 per square foot of bark, and from the summer counts (the current years progeny) they average 99.0 per square foot. It would therefore appear as though the brood for 1936 had been little influenced by natural control factors at the time of the summer analysis, July 27, 1936. Before concluding this, however, we must consider what the highest possible population would have been had all the eggs depostied resulted in live larvae.

In figuring this 61 egg galleries were examined prior to any hatching. Egg counts are shown in detail on Pages 17 & 18, but are summarized below.

No. egg gallereis analyzed..... 61
Total length of those examined..... 637 cm.
Total No. eggs laid.....4848
No. eggs per centimetre..... 7.6

Now considering again our summer analysis, July 27-30, and analyzing it from the lengths of egg galleries instead of square feet of bark, we have:--

Nol egg galleries examined..... 52
Total length..... 795 cm.
Progeny: Eggs 41, larvae 2026.....2067
Progeny per centimetre of egg gallery. 2.6

Thus from the time of egg deposition to the end of July, a little over one month, there has occurred a heavy

mortality of about 66%. Whether this figure is correct or not does not alter the fact that probably mot more than half of those which started are left by the end of 4 or 5 weeks.

Going still further and comparing the number of eggs deposited and the surviving progeny, the following spring, we have:--7.6 eggs deposited on the average per centimetre of egg gallery. By July 27th in these same trees there was an average of 2.6 surviving progeny per centimetre of egg gallery. But 2.6 progeny per centimetre represents 99 progeny per square foot of bark. But the overwintered progeny average only 11.1 per square foot or about 0.3 per centimetre of egg gallery. Hence this brood has decreased from 7.6 per centimetre (as in the egg stage) to 0.3 per centimetre (as recorded in the spring counts for overwintered progeny) which gives a mortality of 96%. This figure is based on actual counts, not guesses nor estimates, except in one instance. I have assumed that the average egg deposition per centimetre was the same in 1935 as it was when analyzed in 1936.

To summarize the above, we find that had all eggs deposited resulted in a young mature adult, the potential population would average about 7.6 per centimetre of egg gallery. We found, however, that between June 12th (when eggs were laid) and July 27th, there were only 2.6 surviving larvae per centimetre of egg gallery or 99 per square foot of bark. Thus, between June 12th and July 27th there had occurred a mortality of about 66%. Furthermore, considering our figures

derived in early June on the overwintered progeny (larvae, pupae and young adults) there were but 11.1 progeny per square foot of bark. This, then, represents a mortality of about 96% between the date the eggs were laid in June until the following June, one year later.

The question now arising concerns the cause of this mortality. It is difficult to portion the influence of the various factors which have contributed. Parasites and predators have played an important role, probably the most important. The two most important orders which act as natural enemies are the Hymenoptera and the Diptera. These two orders, while not equally distributed in all infested logs, averaged 17.3 per square foot of bark in the spring analysis. They are therefore very abundant. In our midsummer counts the presence of these natural enemies was most noticeable in some logs. In one small slab of bark (part of 2 egg galleries) 56 Hymenopterous larvae were present but no bark beetle larvae. The adults of this Hymenopterous parasite (Coeloides) were in abundance on every infested logs on July 27th, and they together with the Diptera (Loncheae) are exerting a strong influence in the reduction of bark beetles.

Infestation of Slash.

As already intimated in this report, what activity there is, is restricted to the slash, there being no indications of any attack upon standing green trees. In checking on this a very thorough examination was made of all the regions logged on all sides of Camp 4 and Camp 7. Slash laid down during the summer of 1935 was reported by the writer at that time as being practically free of any infestation. A June examination in 1936 showed that very little activity had occurred since that time, although a considerable amount of infestation occurred during July, 1936. The slash cut during the winter of 1935-36 was practically free of any attack in mid-June although Ips were commencing and a few Dendroctonus. In the latter part of July a further examination was made and even then many of the winter cut logs were still practically free of any attack by any species. Almost invariably the only attack upon the stumps was done by Trypodendron. Due to this very light infestation of slash, it seems safe to say that the population of all species of bark beetles is far below the number that the slash is capable of maintaining. Considering that this was an active epidemic only two or three years ago and in view of the very light attack upon the slash and the heavy mortality that is now apparent, it seems obvious that the bark beetle population is on a rapid decline at the present time. The same conditions was evident at Camp 7.

Bark Analysis.

Engelmann Spruce, Lumberton, B. C. Camp 4.
Examinations made June 21 to 24.

Logs Infested 1935.

Dendroctonus Counts.			Predators.		
	Alive	Dead	Hymen.	Diptera	Coleop.
Size sample 10"x12".					
Larvae	0	8	5	19	many
Pupae	3	3	25	2	0
Young adults	0	0			
Old adults	0	0			
Size sample 12"x24"					
Larvae	0	0	0	81	many
Pupae	30	8	0	22	0
Young adults	0	0			
Old adults	0	3			
Size sample 7"x14"					
Larvae	18	3	0	5	0
Pupae	10	0	3	0	0
Young adults	0	0			
Old adults	0	0			
Size sample 12"x 18"					
Larvae	1	16	8	3	7
Pupae	1	-	-	4	-
Young adults	8	-			
Old adults	0	-			
Size sample 7"x13#					
Larvae	3	12	2	4	-
Pupae	0	1	5	0	-
Young adults	7	0			
Old adults	0	0			
Size sample 10"x12"					
Larvae	0	8	6	9	4
Pupae	2	0	15	4	0
Old adults	0	0			
Young adults	4	0			
Size sample 6"x 8"					
Larvae	0	5	5	6	4
Pupae	5	0	4	0	0
Young adults	0	0			
Old adults	0	0			

Dendroctonus Counts			Predators		
	Alive	Dead	Hymen.	Diptera	Coleop.
Size sample 6"x14"					
Larvae	0	6	4	1	0
Pupae	3	3	3	0	0
Young adults	2	0			
Old adults	0	0			
Size sample 4"x12"					
Larvae	2		1	4	0
Pupae	6		2	0	0
Young adults					
Size sample 6"x16"					
Larvae	4	7	2	4	0
pupae	5	0	8	0	0
Young adults	0	0			
Old adults	0	0			
Size sample 6"x18"					
Larvae	0	0	0	10	5
Pupae	32	4	0	10	5
Young adults	3	0			
Old adults	0	0			
Size sample 6"x18"					
Larvae	6	0	0	3	0
Pupae	38	0	0	8	4
Young adults	0	0			
Old adults	0	0			
Size sample 12"x12".					
Larvae	0	6	6	4	0
Pupae	2	2	1	0	0
Young adults	7	1			
Old adults	0	0			
Size sample 6"x8"					
Larvae	0	5	0	2	2
Pupae	0	0	0	0	0
Young adults	4	0			
Old adults	0	0			
Size sample 9"x15"					
Larvae	0	25	0	3	0
Pupae	1	2	0	0	0
Young adults	4	0			
Old adults	0	0			
Size sample 12"x 18"					
Larvae	0	27	1	2	0
Pupae	0	3	0	0	0
Youngadults	9	0			
Old adults	0	0			
	/ #I /				

Dendroctonus Counts			Predators		
	Alive	Dead	Hymen.	Diptera	Coleop.
Size sample 8"x14".					
Larvae	0	2	2	3	0
Pupae	13	2	0	1	0
Young adults	0	0			
Old adults	0	0			
Size sample 8"x10"					
Larvae	1	0	0	6	0
Pupae	8	2	0	2	0
Young adults	0	0			
Old adults	0	0			
Size sample 12"x22"					
Larvae	10	4	5	15	1
Pupae	35	5	0	4	0
Young adults	0	0			
Old adults	0	0			
Size sample 10"x18"					
Larvae	0	0	0	6	0
Pupae	1	0	0	4	0
Young adults	15	0			
Old adults	0	0			
Size sample 6"x9"					
Larvae	0	3	0	3	2
Pupae	1	2	1	0	0
Young adults	7	0			
Old adults	0	0			
Size sample 9"x13"					
Larvae	0	9	2	2	4
Pupae	2	10	3	0	0
Young adults	0	0			
Old adults	0	0			
Size sample 12"x14".					
Larvae	0	0	0	10	0
Pupae	8	15	0	2	0
Young adults	0	0			
Old adults	0	0			
Size sample 9"x18".					
Larvae	0	4	3	5	0
Pupae	3	6	5	2	0
Young adults	1	0			
Old adults	1	2			
Size sample 10"x16"					
Larvae	1	2	0	12	7
Pupae	3	6	0	2	0
Young adults	6	0			
Old adults	0	2			

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Hendroctonus Counts			Predators		
	Alive	Dead	Hymen.	Diptera	Coleop.
Size sample 10"x15"					
Larvae	0	4	0	6	0
Pupae	4	4	4	1	0
Young Adults	5	0			
Old adults	0	2			
Size sample 9"x15½					
Larvae	1	2	0	6	0
Pupae	3	3	1	1	0
Young adults	1	0			
Old adults	0	2			
Size sample 9"x16"					
Larvae	0	1	0	6	0
Pupae	2	0	5	4	0
Young adults	0	0			
Old adults	0	2			
Size sample 10"x17"					
Larvae	5	5	0	12	0
Pupae	3	0	0	2	0
Young adults	0	0			
Old adults	0	0			
Size sample 9"x16"					
Larvae	2	8	8	4	0
Pupae	7	0	2	0	0
Young adults	0	0			
Old adults	0	0			
Size sample 9"x16"					
Larvae	4	11	10	3	0
Pupae	4	2	3	0	0
Young adults	0	0			
Old adults	0	0			
Size sample 14½x18"					
Larvae	0	12	3	15	3
Pupae	5	0	0	2	0
Young adults	2	0			
Old adults	0	0			
Size sample 11"x18"					
Larvae	0	12	5	5	0
Pupae	2	1	0	7	0
Young adults	0	0			
Old adults	0	2			
&&					

Dendroctonus Counts			Predators		
	Alive	Dead	Hymen.	Diptera	Coleop.
Size sample 9"x16"					
Larvae	0	0	0	0	0
Pupae	0	1	46	8	0
Young adults	0	8			
Old adults	0	0			
Size sample 9"x16"					
Larvae	1	13	0	4	2
Pupae	0	0	1	0	0
Young adults	0	0			
Old adults	0	0			
Size sample 12"x15"					
Larvae	2	6	6	3	5
Pupae	4	4	0	2	0
Young adults	0	0			
Old adults	0	0			

Egg Gallery Counts, Dendroctonus engelmanni, Lumberton, B.C.
Gall. 1 to 43, June 24 and 25, 1936.
44 to 58, July 2, 1936.

Gall. No.	Length cm.	Total Eggs Laid	Eggs Present	Adults ~~Alive~~	~~Dead.~~
1	7	56	56	2	
2	11	75	75	2	
3	8	40	40	2	
4	11	48	48	2	
5	11	90	90	2	
6	12	91	81	2	
7	9	64	64	2	
8	11	78	78	2	
9	11	84	84	2	
10	10	68	68	2	
11	7	31	31	2	
12	12	96	96	2	
13	9	48	48	2	
14	11	101	101	2	
15	9	57	57	2	
16	10	72	72	2	
17	9	82	82	2	
18	8	74	74	2	
19	9	53	53	2	
20	11	49	49	2	
21	13	109	109	2	
22	12	115	115	2	
23	7	51	51	1	0
24	10	44	44	0	0
25	13	104	104	2	
26	12	45	45	2	
27	10	134	134	1	0
28	14	100	100	2	
29	13	115	115	2	
30	10	117	117	2	
31	12	104	104	2	
32	9	62	62	1	0
33	15	105	105	1	0
34	17	200	200	2	
35	9	74	74	2	
36	8	76	76		
37	8	98	98	1	0
38	9	62	62	1	0
39	15	173	173	2	
40	5	98	98	1	0
41	11	109	109	1	1
42	8	71	71	1	0
43	7	44	44	2	
44	5	50	50	2	
45	9	96	96	2	

Disregard Brackets.

Gall No.	Length cm.	Total Eggs Laid.	Eggs Present	Adults	
				Alive	Dead.
46	9	45	45	2	
47	13	87	87	2	
48	5	26	26	2	
49	7	32	32	2	
50	8	49	49	2	
51	16	90	90	2	
52	16	106	106	2	
53	11	122	122	2	
54	14	68	68	2	
55	13	106	106	2	
56	21	124	124	2	
57	6	33	33	2	
58	12	78	78	2	
59	13	51	51	2	
60	19	51	51	2	
61	6	67	67	1	0

Larval Counts

Dendroctonus engelmanni.

July 27, 1936 Camp 4. Lumberton, B. C.

Gall No.	Length cm.	Eggs Present	Larvae Present Alive	Larvae Present Dead	
1	12	1	31	1	
2	17				
3	16	5	148	0	Bark area 14"x18"(252 sq.ins)
4	14				
5	18				
6	15	0	44	6	Bark area 6"x7" (42 sq.ins.)
7	14				
8	13				
9	15				
10	17				
11	17				
12	17				
13	24	0	494		Area of bark 24"x24" (576 sq. ins.)
14	12				
15	12				
16	11				
17	17				
18	14				
19	14				
20	13				
21	15				
22	15	0	128		Area of bark 16"x22" (352 sq. ins.)
23	11				
24	19				
25	15				
26	14				
27	19				
28	13	0	37	77	Area of bark 12"x18" (216 sq. ins.)
29	12				Dead larvae parasitized.
30	20				
31	19				
32	12				
33	12				
34	13				
35	6	0	493	54	Bark area 21"x24" (504 sq. ins.)
36	22				Larvae killed by predators.
37	26				
38	17				
39	17				
40	21				
41	12		36	13	Larvae killed by predators.

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Gall. No.	Length cm.	Eggs Present	Larvae Present. Alive	Dead	
42	22		40	10	Larvae killed by predators
43	12		43	15	Larvae killed by predators.
44	13		34	10	Larvae killed by predators.
45	14		22	8	Dead larvae, parasitized.
46	12		19	13	Dead larvae, parasitized.
47	?		0	56	Dead larvae, parasitized.
48					
49	15				
50	15		143	?	8 Dipterous larvae.
51	15				
52	17				
53	13	35	314	?	5 Dipterous larvae.
54	15				

Lamb Creek.

The Lamb Creek Valley is situated to the south of the Moyie Valley, this latter being the site of the present logging operations of the B.C. Spruce Mills. The two valleys are separated from each other by a high divide of land. An option of the Lamb Creek timber is held by the B.C. Spruce Mills for which reason they are vitally interested in the insect problem.

Although the lower five miles of this valley was logged about 1910, and certain portions have been burned, there still remains some very fine stands of timber. The cruising summary compiled by Mr. N. Moore follows, and shows in board feet the quantity and species of timber in this area.

Larch	25,723,100
Douglas fir	1,959,700
Engelmann spruce	107,987,000
Balsam fir	5,406,400
Cedar	956,600
Hemlock	15,300
Lodgepole pine	32,607,700
White pine	4,535,500
Total:	179,191,300

Plus cedar poles 476,935 lineal feet.

Although the writer, in company with Mr. Moore, the superintendent, visited this area in 1935, only a small portion

of the timber was seen. At that time we entered from Camp 4 and spent but one day at the upper end of the valley. In 1936 however, six days (June 26-July 1 inc.) were spent in this region by the writer in company with Mr. K. Graham, Pest Investigator, at which time we entered the valley from the Moyie end. The following areas were examined:--Lamb Creek valley to Camp 4 trail, Gold Hill and Little Lamb Creeks, Rabbit Foot Creek, and that area south of Lamb Creek and opposite Rabbit Foot Creek.

RESULTS.

Bark Beetles.

Active Infestations.

The area of greatest bark beetle activity in this country occurs on the south-east side of Lamb Creek and appears as brown patches of trees when viewed from Rabbit Foot Creek. This activity is restricted to Lodgepole and white pine, Dendroctonus monticolae and Ips being quite active. The location of the trees examined were as follows: First infested trees found on survey line ½ mile west of the N. E. corner 9978. Proceeding south along this line one traverses an area where much activity has occurred with a small amount still active. The majority of the infestation has occurred some three or four years ago. Practically all of the Dendroctonus progeny were dead but Ips pupae and young adults were quite prevalent. Dipterous and Hymenopterous predaceous larvae were abundant in some trees and partly consumed bark beetle larvae indicated that they are quite active. General

indications point to a decline in bark beetle activity in this region as the number of trees in which activity occurs is relatively small. The infestation, however, has appeared in spots over quite an area on this side of the valley from GenerCreek north to a point opposite Rabbit Foot Creek, and appears in this spotted nature to the top of the mountain. This is the only actively infested area in this valley.

At the head of Rabbit Foot Creek some very slight activity of bark beetles was noted. Four Lodgepole pines had been attacked by Dendroctonus monticolae in 1934 but not killed. These were further attacked by Ips in 1935, the progeny of which were in the young adult stage by June 29, 1936. The trees were dead when examined. They were located just beyond the point where Rabbit Foot Creek crosses the south line of T.L. 5187

One standing green spruce along Lamb Creek near Tate Creek had been attacked by Dendroctonus in 1935 and was in the course of attack by Ips in 1936.

Old Infestations.

The most important of the old infestations is found at the mouth of Tate Creek where it flows into Lamb Creek. This is reported as having been active seven years ago but has long since subsided. A large quantity of dead spruce is to be seen in this area but no signs of present activity can be seen at present

Another old infestation was noted in lodgepole on Little Lamb Creek above the old logging camp located at the

head of this creek. This has been quite acitve in the past but at present no activity could be seen. Quite a number of the older pines have been killed.

Throughout the Lamb Creek Valley standing dead spruce indicate past activity of Dendroctonus in standing timber. These trees do not occur in concentrated areas but appear individually along the valley.

Windfalls.

Throughout the entire area any windfalls seen were examined to ascertain the prevalence of bark beetles and their natural enemies.

Old windfalls between Gold Hill Creek and the Little Lamb which had been infested several years ago showed indications of old Ips activity and a tremendous population of Hymenopterous parasites. One slab of Bark 10" x 20" revealed 100 empty cocoons.

Green spruce windfalls up the Rabbit Foot Creek showed a considerable amount of activity of Ips and Dendroctonus. These were, for the most part, attacked in 1935, for the Dendroctonus were in the pupal stage. An abundance of Dipterous and Coleopterous larvae were present and had apparently caused a high mortality among the bark beetle larvae.

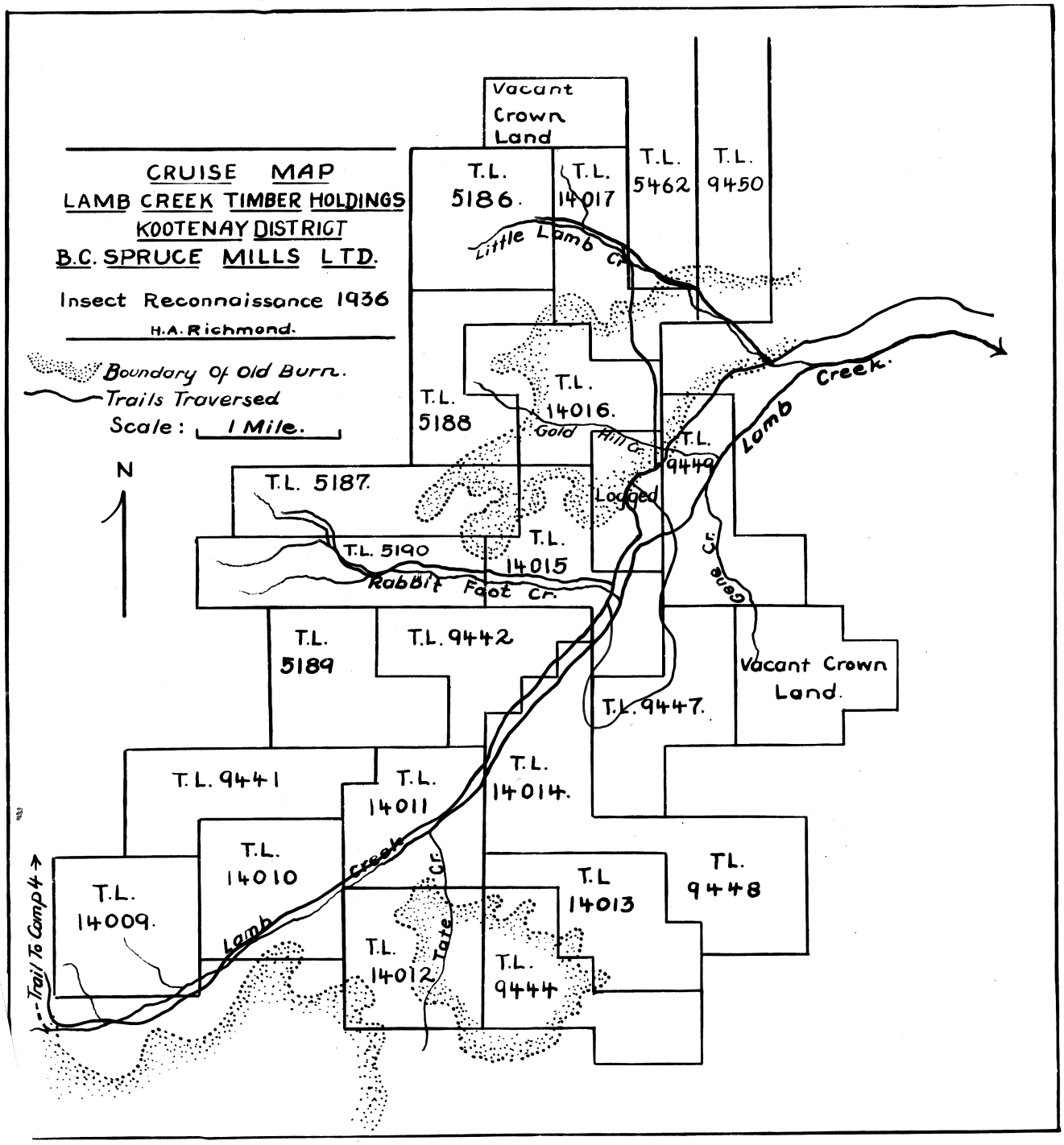
Throughout the entire length of Lamb Creek, windfall spruce showed the activity of Ips and in a few cases, Dendroctonus. One green windfall spruce at the S.W. corner 14014 (N.W. corner 14013) was in course of attack by Dendroctonus which were depositing eggs.

The European Larch Sawfly.

The European Larch Sawfly was noted in two locations in this area. The first of these was on the hillside opposite the Rabbit Foot Creek. An examination in the duff at the base of the larch trees showed several dozen empty pupal cases, but none were found containing live material.

Active feeding of sawfly larvae on young larch was quite prominent at the head of the Little Lamb.

Sawflies no doubt extend throughout the entire larch stands in this country, for we have records of them near Lumberton, Camp 4, the Little Lamb and south-east of Lamb Creek. In no instance are they in an epidemic nature.


CRUISE MAP
LAMB CREEK TIMBER HOLDINGS
KOOTENAY DISTRICT
B.C. SPRUCE MILLS LTD.
Insect Reconnaissance 1936
H.A. Richmond.
Boundary Of Old Burn.
Trails Traversed
Scale: 1 Mile.
N
Vacant Crown Land
T.L. 5186.
T.L. 14017
T.L. 5462
T.L. 9450
Little Lamb Cr.
T.L. 5188
T.L. 14016.
Gold Hill Cr.
T.L. 9449
Lamb Creek.
T.L. 5187.
Logged
T.L. 5190
T.L. 14015
Rabbit Foot Cr.
Gene Cr.
T.L. 5189
T.L. 9442
Vacant Crown Land.
T.L. 9447.
T.L. 9441
T.L. 14011
T.L. 14014.
T.L. 14010
Lamb Creek
Tate Cr.
T.L. 14009.
T.L 14013
TL. 9448
T.L. 14012.
T.L. 9444
Trail To Camp 4

BARK BEETLE RECORDS FROM ASPEN GROVE, B. C. - 1936.

By H. A. Richmond.

Two visits were made to the Aspen Grove area in 1936, one in the spring (May6-15) and one in the fall (Oct. 13-19). The object of these visits was to ascertain if any changes had occurred which might indicate a revival in the activities of bark beetles in that area.

The general situation remains unchanged, with bark beetle activities at a minimum. A considerable amount of data was obtained however, which may prove of value at a time when a new infestation occurs.

Spring Observations - May 6-15.

During the above period the first area examined was located in the Canyon House vicinity where the most active infestation for 1935 was noted. One full day was used in scouting through the timber of this region without finding a single infested tree. Three trees in this area which were just being attacked in September, 1935 had completely drowned out their invaders and so far as could be seen no trees were actively infested. The Portland Ranch area, another likely place was carefully searched, but without success.

The above are the two most recently infested areas which it seems are now in the same condition that the

Main Aspen Grove area reached about 2 years ago.

An attempt was made to get into the Kane and Voght valley areas but this was prevented by a mass of wind-falls across the road about half way in.

Infested tree, however, were encountered in the main Aspen Grove area. Part of this area has been completely free of infestation for the past two years, but this spring infested trees can be found at a rate of about one per section. An examination of these trees showed rather surprising results.

The first tree examined was located near Thompson's Ranch which in turn is about 3 miles on the Merritt side of the camp-site. This portion of the Aspen Grove area was about the earliest to be infested (1930) and has been free of any infested trees for the past two years. Analysis of bark gave the following results:

Slab 1. Size 18" x 24".

Bark beetle larvae alive.....26
" " " dead..... 8
Adults alive.....10
" dead.....40
Dipterous larvae..... 2

Slab 2. Size 6" x 28"

Bark beetle larvae alive.....55
" " " dead 6
Adults alive..... 3
" dead.....10
Dipterous larvae..... 2

Slab 3. Size 10" x 20".

Bark beetle larvae alive.....54
" " " dead.....10
Adults alive.....10
" dead.....30
Dipterous larvae..... 0

Slab 4. Size 12" x 18"

Bark beetle larvae alive.....	87
" " " dead.....	0
Dend. adults alive.....	8
" " dead.....	15
Dipterous larvae.....	3

Bark beetle larvae small, first instar.

Slab 5. Size 12" x 18"

Bark beetle larvae alive.....	94
" " " dead.....	0
Dend. adults alive.....	10
" "2 dead.....	30
Dipterous larvae.....	4

Slab 6. Size 14" x 30"

Bark beetle larvae alive.....	163
" " " dead.....	12
Dend. adults alive.....	11
" dead.....	40
Dipterous larvae	17

Numerous Dendroctonus eggs present.

Slab 7. Size 10" x 24"

Bark beetle larvae alive.....	43
" " " dead.....	6
Dend. adults alive.....	5
" " dead.....	15
Dipterous larvae.....	10

The outstanding feature in this tree is the abundance of live larvae and the complete scarcity of predacious larvae; While counts were made only of the Dipterous larvae, other predacious larvae do appear, but are so minute a count of them is impossible. However, it may be stated in a general way, that predacious larvae were very scarce in the above tree and this no doubt accounts for the quantity of live bark beetle larvae.

In comparison to this, samples were analyzed from two trees located some 3 miles on the Princeton side of the camp. This area has had several infested trees present every year since the major infestation died out 2 years ago.

Slab 8. Size 16" x 26"

Bark beetle larvae alive.....	34
" " " dead.....	2
Dend. adults alive.....	0
" " dead.....	10
Ips adults alive.....	20
" " dead.....	34
Dipterous larvae.....	9

Small predacious larvae (not yet determined) about 25 per 6-inch square.

Slab 9. Size 14" x 28"

Bark beetle larvae alive.....	8
" " " dead.....	9
Dend. adults alive.....	1
" " dead.....	12
Ips " alive.....	2
" " dead.....	19
Dipterous larvae.....	14

Other predacious larvae numerous.

Slab10. Size 13" x 30"

Bark beetle larvae alive.....	1
" " " dead.....	0
Dend. adults alive.....	2
" " dead.....	8
Ips " alive.....	1
" " dead	7
Dipterous larvae.....	15

Other predacious larvae, numerous.

Slab 11. Size 12" x 30"

Bark beetle larvae alive.....	6
" " " dead.....	15
Dend. adults alive.....	2
Dend. " dead.....	8
Ips " alive.....	3
" " dead.....	10
Dipterous larvae.....	24

Slab 12. Size 10" x 22".

Bark beetle larvae alive.....	12
" " " dead.....	?
Dend. adults alive.....	0
" " dead.....	12
Ips adults alive.....	3
" " dead.....	10
Dipterous larvae.....	12

Numerous remains of bark beetle larvae were present in this slab but it was not possible to count them.

Slab 13. Size 14" x 26"

Bark beetle larvae alive.....	12
" " " dead.....	6
Dend. adults alive.....	3
" " dead.....	14
Ips adults alive.....	6
" " dead.....	12
Dipterous larvae.....	21

Slab 14. Size 12" x 30"

Bark beetle larvae alive.....	4
" " " dead.....	4
Dend. adults alive.....	6
" " dead	14
Ips adults alive.....	4
" " dead.....	10
Dipterous larvae.....	21

The low counts of live bark beetle larvae are most noticeable in these latter samples of bark. The counts of dead larvae present do not mean a great deal for they indicate only the dead ones present, not the number of larvae that have died. These figures are significant however, in that they do indicate that the dead larvae have been apparently consumed by predators.

In summarizing these findings the important thing seems to be that the samples 8 - 14 taken from an area where a few infested trees have always been found, showed a

count not greatly different from counts of the 2 previous years.

Samples 1 - 7, however, from a tree isolated in an inactive area where no infested trees have been seen for the past two years showed a tremendous difference in the quantity of live larvae and the small numbers of predators.

It is almost impossible to make very extensive counts of bark samples at the present time simply because there are not the infested trees available.

No egg counts were possible at this time for these late attacked trees in which I had hoped to do this work had drowned out the invading beetles.

A saw-mill installed during the past year in Voght Valley deserves careful watching for new developments but that region proved inacessable this spring due to road conditions.

Autumn Observations From Aspen Grove, B. C., Oct. 13-19, 1936.

Autumn observations in Aspen Grove were made with the purpose of ascertaining wintering habits of bark beetles and their predators, and as well to check on the conditions of the timber in this area. The following data was procured:

Bark Beetles.

Beetle killed trees are still very difficult to locate and from present indications there is no apparent trend toward an increase in their abundance.

Records on their hibernation were obtained however, which are given below as prepared for publication.

The migration of Ips to the forest floor has been reported previously by such workers at Watson (1927), Keen (1933), Leach Orr and Christensen (1934) and Orr (1935). Keen remarked on his surprise in such activity of Ips during October and November in Oregon when one would normally expect insect activity to have ceased. Previous examinations by the writer during the month of September had always failed to reveal any marked migration but the following records taken between October 20-25, 1936 in Aspen Grove, British Columbia, showed this in a marked degree. It appeared more as a general migration involving not only the Ips but much of the secondary Coleoptera common under the bark of beetle infested trees.

This record was obtained from a large Yellow pine killed by Dendroctonus monticolae Hopk. during the summer.

It measured 36 inches D.B.H. and when examined its foliage was of a yellow-green hue. The litter adjacent to the tree's base was a swething mass of beetles. At a distance of some two feet from the tree their population was very scattered although quite evident. Before disturbing any bark on the trunk of the tree, a collar of litter 4 inches wide and 3 inches deep was scooped from around the tree's base, placed in a canvas bag and brought to the Vernonlaboratory for further analysis. The bark on the lower portions of the tree was then pried off and the mass of miscellaneous Coleoptera that poured out was amazing. It would appear that the majority of the tree's population of certain species (Ips, Hypophloeus, Aulonium and Plegaderus) must have been concentrated in this portion of the tree. Possibly they were in the course of migration moving downward under the bark of the tree to ground level, thereupon entering the forest floor.

The collected litter was brought to the Vernon laboratory, placed in a large tin funnel, the stem of which projected into a bottle of alcohol with a seive to prevent the coarser particles from falling through. An electric lamp was placed above with its heat reflected downward. The beetles were thus driven away from the heat and eventually fell into the alcohol. The litter was later examined for any remaining live material.

The following summary lists the live material collected from one cubic foot of the forest floor:

Ips emarginatus Lec.	993
Ips interpunctus Eich.	78
Hylurgops lecontei Sw.	9
Hylurgops subcostulatus Mann.	7
Dendroctonus valens Lec.	3
Hypophloeus substriatus Lec.	3884
Plegaderus nitidus Horn.	2474
Lasconotus complex Lec.	625
Lasconotus laqueatus Lec.	25
Aulonium longum Lec.	287
Rhizophagus Sp.	33
Tenebrioides sinuatus Lec.	13
Staphylinidae.	11
Enoclerus sphegeus Fab.	7
Thanasimus undatulus Say.	3
Epuraea Sp.	3
Stephenopachys substriatus Payk.	2
TOTAL COLEOPTERA	8457
Pseudoscorpions	127
GRAND TOTAL	8584

What role this mass of secondary material plays in the successful continuation of bark beetle infestations is an interesting point for speculation. Should their presence be essential, it suggests a control measure which might have possibilities. Records on hand show severe winters have caused a 100% mortality of Dendroctonus monticolae Hopk., above snow-level in lodgepole pine (Pinus contorta). In the Kootenay National Park, British Columbia, this is most evident. Ips, on the other hand, have survived and this infestation has developed into one in which Ips predominate, and they have apparently enabled the small percentage of surviving Dendrotonus to carry on.

In the case of population studies, when infested trees are caged inearly spring in order to trap the summer's emergence, it is obvious that the final analysis does

not represent the tree's original population migrates, but in certain species it seems to be considerable.

Dipterous Predators.

Dipterous predators are still very prevalent in their larval stages under the bark of infested trees. These are apparently going into the winter in the larval stage. Some were found actively feeding on bark beetle larvae and apparently feeding continues on through the season until cold produces inactivity. Adults of Medeterus and Loncheae were found active on the outside bark of standing infested trees. What their late activity consisted of was not determined. Although a search was made for eggs under flakes of bark none were found.

Clerids.

An attempt was made to ascertain if any Clerid larvae which might be tooimmature to migrate to the soil remained under the bark during the winter. One 18-inch gree which was infested during the summer was felled and all the bark removed and examined. Not a single Clerid larva was found although several were recovered in the soil at the tree's base. Similarly, on larger trees which were not cut but were examined about their bases, no Clerid larvae were found. Earlier work indicates that only in rare cases do they remain in the tree and I collected no data this fall to disprove these earlier records.

The hibernation of adults takes place in the

soil at the bases of infested trees as revealed this fall, in addition to other places of hibernation as revealed in earlier records.

Adults of Enoclerus and Thanasimus were still quite active when examined this fall and were seen running over the bark of infested trees, probably feeding. No egg deposition was seen.

A search was made for the presence of the root borer Hypomolyx piceus and only three signs of any work at the roots were seen. These workings were very inconspicuous in comparison to the work seen in the Kootenay Parks and in that no larvae or adults could be discovered I cannot say what insect had been responsible for this work.

A collection of predaceous larvae from under the bark of infested trees was brought to Vernon for rearing.

Reconnaissance.

The infestation at Aspen Grove is still at the low ebb reported last year. Only an occasional tree can be found, although an extensive examination was made. The following areas were examined:--Aspen Grove, south to the vicintiy of Canyon House, including a trip to the summit of the hills west of the main Coalmont Road at a point where Otter Creek crosses the road at the head of the main canyon, Brookmere, Davis Lake, One-Mile Road and east of this road four miles to a deserted pre-emption directly above the first slew seen on the left-hand side of the main road travelling from the One-Mile road junction, Allen and Kentucky Lakes

through the old Morgan Copper Mine, Kane Valley west to the far side of Goldman's property in Voght Valley. These areas included all points where the last signs of bark beetle acitivity were seen.

Records for 1936 on the Douglas Fir Bark Beetle D. pseudotsugae From Trinity Valley, B. C.

-by-
H. A. Richmond.

During the past season certain miscellaneous records were obtained upon the egg-laying and survival of larvae of the Douglas Fir bark beetle Dendroctonus pseudotsugae. These records were procured on the 40-acre plot in Trinity Valley which was alloted to the Vernon laboratory. Work was done in this area by the writer between May 20-25, 1936, and later records were obtained by Mr. K. G. Graham between Aug. 13-15.

In the spring work it was found that all logs cut during the winter were in the course of infestation by adults (D. pseudotsugae) by May 20th. None of these egg galleries had been completed and a heavy egg deposition was evident in all galleries. Paired adults were present in all egg galleries and none were abandoned. No secondary material was noted in any of the 115 egg galleries examined.

In an examination of last year's infested logs, while an occasional large larva or adult could be found, the majority of larval mines contained dried larval skins showing the destruction of the larvae, a condition very similar to that

encountered in Aspen Grove. An analysis of bark was made from infested logs which were cut during the winter, the results of which follow. While standing green trees were becoming infested at the time of this examination, galleries were much shorter than in the winter-cut logs, so the analysis was made from the latter.

EGG GALLERY EXAMINATIONS (D. pseudotsugae).

F: Female
M: Male

L: Left side of gallery.
R: Right side of gallery.

Exp. 17618.

No.	Date	Length cm.	Eggs Laid	Adults Present	Remarks.
1	May 28	14	52	F	L. 29; R. 23.
2	"	14	37	F	L. 14; R. 23
3	"	5	6	F	L. 6; R. 0
4	"	8	28	F & M	
5	"	7	18	"	
6	"	10	25	"	
7	"	9	24	"	
8	"	17	51	"	
9	"	9	49	"	
10	"	13	25	"	
11	"	16	22	"	L. 22; R. 0.
12	"	12	37	"	
13	"	14	45	"	
14	"	14	26	"	
15	"	10	23	"	
16	"	14	14	"	
17	"	16	43	"	
18	"	7	21	"	
19	"	9	11	"	
20	"	5	10	"	
21	"	8	19	"	
22	"	16	58	"	
23	"	10	22	"	
24	"	11	19	"	
25	"	11	49	"	
26	"	9	24	"	
27	"	7	24	"	
28	"	9	10	"	
29	"	8	31	"	

No.	Date	Length cm.	Eggs laid	Adults Present	Remarks.
30	May 28	12	58	F & M	L. 0; R.58
31	"	9	27	"	
32	"	7	15	"	
33	"	7	8	"	
34	"	16	31	"	
35	"	7	24	"	
36	"	7	18	"	
37	"	12	21	"	
38	"	3	2	"	
39	"	10	29	"	
40	"	10	50	"	
41	"	3	12	"	
42	"	7	17	"	
43	"	8	16	"	
44	"	5	23	"	
45	"	13	45	"	
46	"	12	34	"	
47	"	10	28	"	
48	"	10	34	"	
49	"	5	13	"	
50	"	14	59	"	
51	"	6	15	"	
52	"	4	18	"	
53	"	10	32	"	
54	"	10	17	"	
55	"	9	16	"	
56	"	5	18	"	
57	"	7	14	"	
58	"	16	40	"	
59	"	18	52	"	
60	"	21	38	"	
61	"	14	28	"	
62	"	12	12	"	
63	"	8	29	"	
64	"	6	6	"	
65	"	16	22	"	
66	"	10	17	"	
67	"	7	8	"	
68	"	13	28	"	
69	May 29	21	38	"	
70	"	12	40	"	
71	"	19	31	"	
72	"	24	43	"	
73	"	8	9	"	
74	"	22	51	"	
75	"	16	47	"	
76	"	18	18	"	
77	"	16	36	"	
78	"	8	44	"	
79	"	10	32	"	
80	"	27	70	"	

No.	Date	Length cm.	Eggs Laid	Adults Present	Remarks.
81	May 29	13	24	F & M	
82	"	14	25	"	
83	"	13	39	"	
84	"	12	35	"	
85	"	6	13	"	
86	"	4	20	"	
87	"	3	9	"	
88	"	6	20	"	
89	"	9	13	"	
90	"	6	16	"	
91	"	10	24	"	
92	"	6	17	"	
93	"	6	16	"	
94	"	5	11	"	
95	"	8	20	"	
96	"	7	24	"	
97	"	6	16	"	
98	"	7	19	"	
99	"	5	5	"	
100	"	6	20	"	
101	"	6	18	"	
102	"	16	31	"	
103	"	10	29	"	
104	"	12	34	"	
105	"	14	59	"	
106	"	21	38	"	
107	"	22	50	"	
108	"	27	64	"	
109	"	9	16	"	
110	"	12	35	"	
111	"	13	45	"	
112	"	12	28	"	
113	"	6	17	"	
114	"	4	16	"	
115	"	10	28		

TOTAL LENGTH OF EGG GALLERIES..... 1271 cm.

TOTAL NO. EGGS LAID..... 3200

TOTAL NO. EGG GALLERIES..... 115

Average No. Eggs Per Cm..... 2.51 eggs.

Bark analysis work was done between Aug. 13-15, 1936 by Mr. K. G. Graham at which time data was procured in order that a comparision might be made with the number of eggs laid and the surviving progeny. The following figures were obtained from this work.

Tabulation of analysis of square foot sections of bark taken alternately on the N.W., W., S. W. sides of Douglas Fir check tree, attacked in May, Trinity Valley, B. C.

	Average Height in Feet of sample from ground.											
	NW 6'	W 9'	SW 14	W 17	NW 21	W 25	SW 29	W 33	NW 37	W 41	SW 45	W 50
Live larvae	8	3	2	8	2	4	2	1	7	0	2	3
" pupae	9	8	4	5	11	0	0	4	8	5	4	4
Young adults	0	4	20	20	12	37	37	10	20	25	11	31
Clerids	3	2	0	1	0	0	0	0	0	0	1	0
Hym. Par.	2	2	0	0	1	1	2	0	3	3	3	1
Dipt. Larvae	0	0	0	0	1	2	1	2	1	0	5	2

Note: Many dead larvae may have been killed by pitch.

Tabulation of analyses of square feet of bark from tree injected with Sodium Selenate May, 1936.

Size of Slab	3 x 1	3 x 1	3 x 1	3 x 1
Live larvae	3	12	10	12
" pupae	7	11	20	8
Young adults	26	33	32	0
Hym. Parasites	12	23	8	0
Dipt. Larvae	0	2	0	0
Clerids	0	0	6	0
Height above ground	2'	5'	11'	18'

Note:

Normal survival based on above about 10%.

Summary of Lengths of Egg Galleries of *D. pseudotsugae* measured by K. Graham, Aug. 15, 1936.

Size of Slab	Lengths of Egg Galleries in cm.							
17"x34"								
	17	15	20	17	21	9	20	20
	15	14	15	20	19	11	24	16
30' - 33' from	13	16	20	15	12	14	26	11
ground.	14	14	15	18	13	9	12	12
	10	11	11	15	21	20	11	23
Total length 698 cm.	19	24	15	12	Total length 698cm.			
13"x34"	10	15	16	15	14	20	12	
	15	21	20	16	15	14	20	
18' & 21' from	15	15	21	19	15	21	15	
ground.	19	15			Total length 378 cm.			
18"x34"								
	10	11	22	15	15	12	22	
	22	9	8	23	15	15	15	
6' - 9' from	13	10	17	16	16	16	11	
ground.	13				Total length 326 cm.			
18"x34"	15	19	17	11	14	13	20	
	11	14	25	23	15	18	13	
10' - 13' from	15	15	22	21	16	16	17	
ground	16	10	10	20	20	16	28	
	25				Total length 495 cm.			
18" x 34"	18	13	21	17	15	13	25	
	21	20	21	12	14	12	14	
14' - 17' from	12	12	17	14	30	11	16	
ground.	20	16	28	15	19	20	21	
	12	20	20		Total length 538 cm.			

To summarize the foregoing there appears to be a progression in numbers of galleries per square foot proceeding from the ground upward. In the following table these slabs are arranged from the ground upward.

Area	No. Egg Gall.	Total length Gall. cm.	Length of Gall. per sq. ft. cm.	Average length Gall. cm.	Gall. per sq. ft.	Height of Sample.
18"x34"	22	326	77	15	5	6-9
18"x34"	29	495	116.5	17	7	10-13
18"x34"	31	538	126.5	17.3	7.3	14-17
13"x34"	23	378	123	16.5	7.5	18-21
17"x34"	44	698	174	16	11	30-33

Inspection Report of Timber Licenses of A. G. Lambert & Co., - Nelson, B. C.

- H. A. Richmond -

On request from the above timber operator, an inspection was made of their timber licenses located on the east and west forks of Ingram Creek near Midway, B. C. These licences were examined by the writer in company with Messrs. R. E. Allen, District Forester at Nelson, B. C., and G. G. Lambert, also of Nelson. This inspection was made on October 5th and 6th, 1936. The object of the inspection was to determine the cause of the dying and dead timber on these limits and to ascertain how much future destruction might be expected.

After spending one day on the east fork, and one day on the west fork of Ingram Creek the following information was obtained:

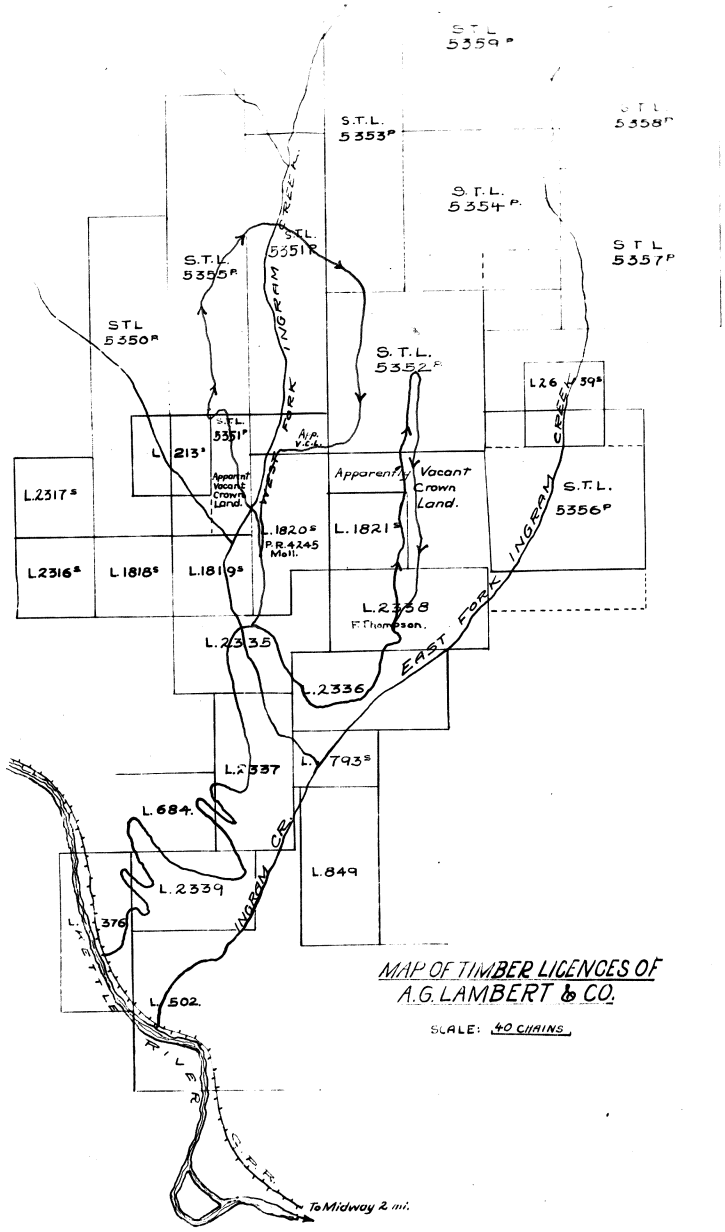
This entire area has been the site of a fairly widespread outbreak of the bark beetle Dendroctonus pseudotsugae Hopk. The infestation has been chiefly confined to fir but a considerable amount of larch has also been killed. The exact year when this infestation was at its peak can only be guessed, for it has long since subsided, and it is with difficulty that any active work can be found at present. The disappearance of this infestation has probably been due to an increase of natural enemies for in the examinations made, it was evident

that in the trees actively infested this year very few larvae reached the pupal stage due no doubt to natural enemies. The following were recovered in large numbers all of which have been recorded as having more or less predacious habits.: Hypophloeus, Rhizophagous, Plegaderus and a small Staphylinid (Coleoptera); Coeloides (Hymenoptera, Braconidae) and Lonchaea (Diptera Lonchaeidae). It can be stated with assurance that no further killing of green timber may be expected in the near future.

The accompanying map shows an outline of the route travelled. The heaviest infestation and probably the oldest is on the west fork of the Ingram Creek. Here a rough estimate on the areas covered by us would place the dead fir at about 80% to 90%. On the east fork the infestation has been less severe and about 60% to 70% of the fir has been killed. The dead larch likewise is more evident on the west fork than on the east fork of Ingram Creek. The heaviest infestation on the east fork has occurred on T.L. 5356. These figures of course, are only estimates arrived at by the three of us on the samples of timber through which we passed.

The dead timber is for the most part rotting in the sapwood but is apparently quite sound at the heart. There has been very little windfall to date but it is questionable how much longer the earlier killed timber can be expected to stand. Unless salvage work is proceeded with shortly, future logging may be considerably complicated by the prevalence of down timber.

It was strongly recommended to the District Forester that some provision should be made by the forest service to encourage the Lambert Co. to log this area as soon as possible as they (the Lambert Co.) felt that much of the dead timber could be salvaged.



MAP OF TIMBER LICENCES OF
A.G. LAMBERT & CO.

SCALE: 40 CHAINS

C. P. R. Tie-Cutting Operations, Cherry Creek, B. C.

- H. A. Richmond/-

The Cherry Creek timber limits, owned and operated by the C. P. R. are located 14 miles west of Kamloops on the Kamloops-Vancouver highway. The present operations are situated 5 miles from the main road where a portable saw-mill has been installed.

The limits comprise 47 sections and run about 80% Douglas Fir according to the Kamloops Forest office. Cutting commenced on Thursday, May 14, 1936 on an 8-year programme.

The writer attempted to visit this area on May 14, but the roads were so bad that I broke the front spring of the car and abandoned the attempt for the time being. A fairly good sample of the timber was seen however. Bark beetles are present and active in small numbers and infested firs may be seen in groups of 2 or 3 trees. Nothing of a serious nature was observed, but the area should be closely watched in view of the new logging activities.

Mr. D. Beech, in charge of the office at this operation was advised of my intended visit and showed considerable interest in the problem. A detailed examination of this region will be made this spring.

PUBLICATIONS - 1936.

Hopping, Ralph - A Revision of the Genus Macropogon Motsch, Pan-Pacific Entomologist, XII (1) p. 45.

Hopping, Geo. R. and Leech, H. G. - Sawfly Biologies, Neodiprion tsugae Midd., Can. Ent. LXVIII (4) p. 71

Hopping, Geo. R., - Entomological Illustrating, Proc. Ent. Soc. of B. C. No. 32, January 1936. p. 20.

Richmond, H. A. - Host Selection Studies of Dendroctonus Monticolae Hopk. in Southern British Columbia., Forestry Chronicle IX (2) p. 60.

In Press

Hopping, Ralph, - The Lepturini of America North of Mexico, Part II. Illustrated by G. R. Hopping.

Hopping, Geo. R., - The Clytini of Boreal America, Part II, Illustrated by author. This will appear soon in the Annalls of the Ent. Society of America.

Inventory

Vernon Forest Insect Laboratory

as of Dec. 31, 1936.

Scientific Instruments

1 Bausch and Lomb compound microscope	120.00
1 Leitz binocular microscope	141.00
1 Spencer binocular microscope	143.00
1 Dissecting microscope	178.95
1 Zeiss Ikon Maximar camera and case	67.15
1 Klimax camera	65.00
1 exposure calculatro	10.00
1 substage condenser	13.00
2 hygrothermographs (Negretti & Zambra)	150.00
1 Topley's aneroid barometer	25.00
2 Abney levels	30.00
2 Maximum recording thermometers (N. & Z.)	21.00
2 Minimum " " "	21.00
2 Tycos maximum thermometers	15.00
2 " minimum "	15.00
2 " (Max. & Min.) "	15.00
1 minimum recording pocket thermometer	6.75
1 wet and dry bulb thermometer (deficient)	7.50
3 Accoson nitro thermometers, pocket (one broken)	7.50

Scientific Instruments (continued).

1 Zeiss camera lucida	25.00
1 monocular field glass	20.00
1 light directing lens and stand	5.00
1 7.5 X triple Aplanat hand lens	6.00
1 Leitz 16 X and 32 X double hand lens	7.50
1 Zeiss 8 X hand lens	6.61
1 8 X hand lens	6.00
1 Balance scales	8.60
1 Sling psychrometer	10.00
	1146.56

Scientific Equipment.

1 micrometer grid disc	3.50
1 Syringe and needles	1.90
1 micrometer slide	5.00
1 Barthel blast burner	8.45
2 increment borers 6" and 9"	10.00
1 - 100' steel surveyor's tape	4.50
1 pair Starrett Mm. calipers	1.30
1 steel diameter tape	5.00
2 metric steel rules 6"	1.00
3 insect collecting nets	15.00
3 dozen Schmitt insect cases	90.00
2 camera tripods	8.00
1 tilting tripod head	4.00
1 film pack adapter	2.00
1 de Gryse insect trap	14.50
1 [illegible]	

Scientific Equipment (continued)

1 Substage microscope lamp	6.50
1 Spencer microscope lamp	23.92
1 Spencer microscope lamp	23.00
1 drawing board	4.50
	232.07

Scientific Supplies

5 pairs entomological scissors	1.50
2 " large scissors	1.00
1 " curved dissecting scissors	.50
2 " dissecting scissors	.80
2 " Dissecting forceps	1.20
2 " dissecting forceps	.60
4 " " "	1.44
7 " entomological tweezers	2.80
6 dissecting needles	.30
3 scalpels	1.50
3 mapping pens	7.50
1 box microscope slides	.65
144 microscope slides	.75
4 boxes cover glasses	2.00
3000 aluminium tree tags	13.80
2 belljars	2.00
2 - 50 cc. graduates	1.00
2 - 250 cc. "	1.20
2 - glass funnels	.60
1 - 500 cc. beaker	.40

Scientific Supplies (continued)

6	Petrie culture dishes	1.80
2	- 250 cc. beakers	.50
3	Pyrex beakers	.60
12	Petrie dishes	1.46
12	large mouth jars	1.20
2	gross screw cap sq. jars	12.00
5	crucibles	2.00
4	gross glass vials	14.20
2	books lens paper	.50
1	box filter paper	.20
8	hygrometer wicks	1.20
5	gross assorted corks	2.50
9500	insect pins	19.00
		&&98.70

Chemicals

4	bottles fly repellent	1.00
1	bottle hydrogen peroxide	.25
1	" methyl hydrate	.65
1	quart 95% alcohol	3.00
1	bottle Xylol	1.00
1	" amyl acetate	.85
1	" Sugar formalin	.65
1	" formaldehyde	.75
1	" collodion	.60
1	" acetic acid	.55

Chemicals (continued)

1 bottle carbon bisulphide	1.00
2 " Reeves fixative	.50
2 " Canada balsam	.50
1 " picric acid (crystal)	.60
1 " KOH (crystal)	.80
1 lb. sodium selenate	4.50
	17.20

Office Equipment

1 Remington standard typewriter	160.00
1 Imperial portable typewriter	60.00
1 copy stand	2000
1 file punch	2.65
1 double paper punch	4.50
1 pencil sharpener	3.10
1 leather manuscript carrying case	4.50
2 inkwells	.40
2 paper cutters	.20
4 desk calendars	2.00
2 rubber stamps and ink pads	1.00
1 photographic trimming board	8.25
4 metal waste-paper baskets	7.20
	255.80

Office Supplies

1500 sheets 8 X 10 plain typing paper

1500 " 8½ X 11 impression paper

1000 " 8 X 13 plain typing paper

Office Supplies (continued)

1000 sheets thin follow

4500 " corn bond

1500 " 8 X 13 glazed follow

4500 " letterhead

1050 expense forms

4000 Dom. Entomological envelopes

1500 plain official envelopes

28 leave forms

50 pest survey forms

7 application forms (Civil Service)

13 manuscript forms

80 sheets loose-leaf binder

21 stenographic note-books

22 medium-size brown envelopes

22 large-size brown envelopes

6 boxes carbon paper

2 art gum erasers

1 box Prang watercolours

1 box Dixon's coloured pencils

5 boxes paper fasteners

8 boxes paper clips

9 crow-quill nibs

2 " " holders

2 bottles Higgins waterproof black ink

3 tubes Carter's glue

Office Supplies (continued)

9 copying pencils

5 boxes business cards.

34 experimental record books

100 small black note-books

4 dozen ruled pads

12 plain pads

100 - 3" X 5" white, ruled, filing cards

1 Dietzgen T-square

2 Dietzgen triangles 30° and 45°

Field Equipment

3 Coleman gas stoves (one worn out)	44.80
3 Coleman lanterns (one worn out)	29.00
6 rearing cages	28.20
22 glass rearing jars	5.50
7 Woods eiderdown sleeping-bags	280.00
1 Baker tent 7' X 9'	12.50
2 duck tents 10' X 12'	80.00
1 cork tent 12' x 15'	33.13
1 large Amazon tent & fly	60.00
1 silk tent 10' X 12'	40.00
3 silk tents 7' X 9'	90.00
1 tent fly 10' X 12'	10.00
1 " " 16' X 16'	19.61
2 tarpaulins 9' X 16'	16.00
1 pack sack	2.50

Field Equipment (continued)

4 canvas manuscript carrying cases	8.00
2 boy's axes	3.00
2 pole axes	3.50
1 double bit axe	2.50
1 canvas water bag	.50
1 draw knife	3.25
2 cross-cut saws	17.65
3 hand-saws	6.75
2 shovels	2.20
2 rakes	1.65
1 mattock	1.25
2 hammers	2.00
2 tack hammers	.50
2 carborundum stones	.50
2 coal-oil lanterns	3.50
1 cook stove (worn out)	25.00
3 wedges	2.90
2 airtight heaters	10.00
17 length stove pipe	3.20
1 wricking bar	..75
1 water tank	4.00
3 wash-tubs	5.00
2 pails	.85
1 hoe	1.25
1 broom	.35
Camping utensils for five men	28.00
	889.29

Automotive Equipment.

1 Chevrolet 4-door sedan, 1931	950.00
1 " 2-door coach, 1932	965.00
1 automobile trailer	25.00
	1940.00

Books

Blatchley, Coleoptera of Indiana	10.00
Blatchley,& Leng, Rhynchophora of N. E. America	7.50
Boving & Craghead, Larvae of Coleoptera	7.50
Bradley, Manual of the Genus of Beetles of America north of Mexico	5.00
Cassells's French Dictionary	2.50
Cassell's German Dictionary	2.50
Chamberlin, Forest Entomology (2 parts)	1.00
Comstock, An Introduction to Entomology	5.00
Concise Oxford Dictionary	2.50
Curran, North American Diptera	7.50
Essig, Insects of Western North America	10.00
Felt, Manual of Tree and Shrub Insects	2.50
Felt & Rankin, Insects & Diseases of Ornamental Shrubs	5.00
Graham, Forest Entomology (2 copies)	7.00
Henry, Flora of Southern B. C.	2.65
Hodgman & Lange, Handbook of Chemistry & Physics	5.00
Junk, Coleopterorum Catalogus, Parts 39, 73 and 74	6.00
Leng, Catalogue of Coleoptera of America north of Mexico, with supplements	15.00
Needham, Frost & Tothill - Leaf-Mining Insects	6.00

Books (continued)

Nusslin & Rhumbler - Forstinsektenkunde	7.50
Ribinson & Fernald - Gray - New Manual of Botany	2.50
Schlich's Manual of Forestry	5.00
Smith, Glossary of Entomology	3.00
Smith's Latin-English Dictionary	2.50
Trelease & Yuill - Prep. of Technical & Scientific Papers	2.00
Insects & Climate - Uvarov	10.00
Principles of Insect Morphiology - Snodgrass	6.00
	148.65

Also a great number of separates of individual articles.

Inventory

Vancouver Forest Insect Sub-Laboratory

As of Dec. 31, 1936.

Scientific Instruments

1 Spencer binocular microscope, complete with 3 sets oculars, 3 objectives, stand & case	143.00
1 Negretti & Zambra hygrothermograph	75.00
1 Zeiss monocular field glass	18.00
2 " " minimum reg. thermometers	21.00
2 " " maximum " "	21.00
1 unmatched set max. & min. Tycos thermometers	15.00
1 set Tycos wet and dry bulb thermometers	7.50
2 Bak-Fin thermometers in cases	5.00
1 Edney swing psychrometer	10.00
1 pocket type aneroid barometer	25.00
1 cruiser's compass	8.10
1 Mattson increment borer	5.00
1 Zeiss Ikon Maximar camera & case	67.15
1 Luer B-D syringe	4.00
1 La Motte soil testing set	10.00
1 B. & L. hand lens	7.50
1 Exposure meter Drem Justophet	10.00
	452.25

Scientific Equipment

Vancouver

1 B. & L. stage micrometer	5.00
1 micrometer ocular disc	3.50
1 metal tripod for camera	4.00
1 tilting head attachment for tripod	4.00
1 veriner type calliper	1.30
1 electric hot plate	3.60
5 Schmitt boxes	12.50
60 Riker mounts (43 used)	12.00
1 Zeiss Ikon sky filter	3.35
	49.25

Scientific Supplies.

Vancouver

2 pairs scissors	.60
4 pairs forceps	1.50
1 ruling pen	1.20
3 Pyrex glass beakers	.75
1 - 100 cc. graduate	.50
4 slide boxes	1.00
12 wide-mouth bottles	3.60
1 collecting net	3.50
1 steel tape, 50'	4.50
	17.15

Office Equipment

Vancouver

1 desk lamp	1.95

Field Equipment

Vancouver

1 eiderdown sleeping bag	40.00
1 tarpaulin 16' X 16'	12.50
1 canvas carrying case	2.50
1 Wood's pack sack	4.50
1 Coleman camp stove	14.60
1 Coleman lantern	10.00
1 2-man cooking outfit	12.00
1 McClarey 2-gallon coal oil can	1.10
1 SMP 1-gallon coal oil can	.75
1 double-bitted axe	2.50
1 boy's axe	1.50
1 Spear & Jackson hand saw	6.50
1 hand saw	4.50
1 cross-cut saw 4'	8.50
1 " " " 5'	10.00
2 hammers	2.00
1 long-handled shovel	1.50
1 rake	.85
1 carborundum stone	.60
1 chisel and 1 gouge	1.80
1 United Drug Co. First-aid kit	4.50
12 portable insect rearing cages	50.40
6 glass rearing jars	1.50
6 plant pots 8" top	2.00
	196.00

SUMMARY

Vernon Forest Insect Laboratory

and

Vancouver Sub-Laboratory

Scientific Instruments	1598.81
" Equipment	281.32
" Supplies	115.85
Chemicals	17.20
Office Equipment	450.80
Field Equipment	1085.29
Automotive Equipment	1940.00
Books	148.65
Total.....	5637.92

Expenditures for the Fiscal Year 1936-37.

Sub-Allot. No. 2. - Communications.

Telegraph	8.49	
Telephone	115.75	
Postage	61.98	186.22

Sub-Allot. No. 3. - Equipment.

Gass	177.80	
Oil and Grease	41.45	
Tires	44.76	
Labour	83.75	
Materials	22.92	
Scientific Equipment	39.15	409.03

Sub.-Allot No. 7. - Misc. Current Expenses.

Licenses	3.00	
Miscellaneous	2.86	5.86

Sub-Allot No. 9. - Salaries.

Hopping, R. H.	2599.20	
Hopping, C. R. H.	1816.19	
Mathers, W.G.	1414.10	
Richmond, H. A.	1489.14	
Jackson, Miss G. H.	912.00	
Leech, H. B.	486.56	
Graham, K.	491.91	
Janitor	38.50	
Eager, Miss E. F.	120.00	9367.60

Sub.-Allot 11. - Rents.

P. O. boxes	6.10	6.10

Sub-Allot 13 - Supplies

Chemicals	7.40	
Photo Supplies	25.58	
Hardware	16.57	
Insect Supplies	1.25	
Field Supplies	19.24	
Subsistence	179.52	
Miscellaneous	33.95	283.54

Sub-Allot 14 - Transportation of Things.

Freight	5.26	
Express	7.97	
Cartage	3.20	16.43

Sub-Allot 15 - Transportation of Persons.

Hopping, R.	357.07	
Hopping, G. R.	174.65	
Mathers, W. G.	393.24	
Richmond, M. A.	324.14	
Leech, Hugh	237.72	
Graham, Kenneth	18.20	1505.02
		$11,779.80

Estimate for the fiscal year 1936-37.	14,217.80
Actual Expenditures	11,779.80
Balance on Estimate	2,438.00

Actual Expenditures	11,779.80
Salaries	9,367.60
All other expenditures other than Salaries.	2,412.20

Note: Our expenditures were only a little over 25% of our salaries. This is too small an amount to accomplish good work in a district as large as British Columbia and Western Alberta.

Ralph Hopping.
Entomologist.

I N D E X

A.

B.

B. (continued)

C.

D.

D. (continued)

E.

F.

F. (continued)

G.

H.

I.

K.

L.

L. (continued)

M.

N.

N. (continued)

O.

P.

R.

S.

T.

T. (continued)

U.

V.

W.

X.

Z.

Pacific 1936 Insect and Disease Species Index