condition. However, it was noted that 12 of 87 beetles recorded as having good response had numerous internal nematodes and 13 of 22 beetles with a negative response had no internal nematodes.

The mites were external in all but two cases. Most were six-legged immature forms under the elytra.

In the second experiment, samples of beetles showing a strong flight response, as indicated by tossing, were attached to individual flight mills described by Chapman (Forest Biology Laboratory, Victoria, B.C., Interim Report. 1954). Thirty beetles were flown for a 4-hour period. As most of the beetles tended to fly intermittently the starting and stopping times were recorded and the flying time totalized. At the completion of the tests each individual was dissected and observations made as in the first experiment. Only four beetles had mites so their effect was disregarded.

Student's "t" test was used to compare the mean flying times of the uninfested males and females, and showed no significant difference. The mean flying time of all uninfested beetles was then used as a basis for comparison of the various degrees of infestation (internal nematodes only, external nematodes only, both internal and external nematodes, and internal nematodes regardless of infestation by external forms). There was no significant difference in any of the comparisons. The means, degrees of freedom and "t" values are given in Table II.

TABLE I

Flight Response and Dissection Results of 120 Douglas-fir Beetles

Response	Total	Gut condition		Sex		No. Parasites	Nematodes			Mites only	Mites and Nematodes
		Full	Empty	Male	Female		Internal only	External only	Internal and External		
Positive	98	7	91	30	68	6	1	20	23	6	54
Negative	22	3	19	8	14	0	1	4	7	2	14
Total	120	10	110	38	82	6	2	24	30	8	68

TABLE II

Analysis of Total Flying Times in 4-Hour Period of 30 Douglas-Fir Beetles with Various Degrees of Infestation

Comparison and infestation	Mean flying time	d.f.	"t"
Uninfested males	156.7 min.		
vs.			
Uninfested females	147.4 "	7	.0016
Total uninfested vs.	152 min.		
1 External nematodes only	152 "	17	.0000
2 Internal nematodes only	148 "	13	.0913
3 Internal and external nematodes	181 "	12	.9500
4 Internal nematodes*	163 "	28	.4570

* Any beetles with internal nematodes regardless of external forms.

The first test indicates that the presence of mites and nematodes has no significant effect on the flight response of the insect immediately following emergence. The second test indicates the nematodes do not affect flight duration at this time.—M. D. Atkins.

Dieback of Douglas Fir.—Damage to the leaders and laterals on reproduction and sapling-sized (under 35 feet tall) Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco) was noted in the spring of 1956. An examination of young stands in widely separated regions showed the damage to be general and restricted to Douglas fir. Although light damage, under 1 to 2 per cent incidence of dead leaders, was found in most areas, moderate damage was noted near Salmon River in both natural regeneration and plantations, and severe damage near Sooke in natural regeneration. Sample plot analysis showed that dead leaders averaged 22 per cent and 52 per cent in damaged areas at Salmon River and Sooke respectively. Both areas of concentrated damage were on exposed dry slopes underlain with deep gravel which lacked ground water during the growing season. Despite this dryness Douglas fir was making good height growth. In the other areas examined the disorder appeared to occur on a random basis and was not correlated with exposure, elevation, or aspect. Frequently those areas with the best height growth had dieback damage.

A severe cold period, with dry air and strong winds which began on November 11, 1955, suddenly terminating a previous moist mild period, is believed to have caused the damage noted.

The dieback was evidenced by a yellowing, reddening, and then a thinning or loss of needles, followed by cracking of the bark and dying of the 1955 leader or top laterals. In the fall of 1956 there was extensive callusing and bark splitting at the juncture of the killed and healthy tissue. Side branches at and between whorls were observed to turn yellow and die. At Sooke, in addition to the above damage and frequently on the same trees, although not necessarily associated with the same fungi, there were trunk cankers at the juncture of branch and trunk. These cankers enlarged throughout the summer to girdle the bark, and killed the distal portion of the tree. Resinosis was generally absent except where the Douglas-fir bark beetle (*Dendroctonus pseudotsugae* Hopk.) was active.

Progressive dying in successively older branch whorls was observed at Sooke as the fungi which entered through the weakened or dead tops moved down the sapwood of the trunk. Some trees with this type of infection have already died. Trees have also been killed by trunk cankers. Resin soaking observed in the new springwood has not halted the lateral spread of fungi in the trunk. Where the tip of a leader is killed, and one lateral shows dominance, the spike of dead sapwood provides an entrance court for decay-producing fungi.

The most frequently isolated fungi from damaged leaders have been *Pullularia* sp., and *Phomopsis* sp. From the trunk cankers, *Dasyscyphus* sp., and *Stereum sanguinolentum* (Alb. & Schw. ex Fr.) Fr. have been isolated. These fungi have all been recorded previously as weakly parasitic under conditions of host injury or weakening. Inoculations are in progress in both field and greenhouse to test the pathogenicity of these fungi. Douglas-fir seedlings weakened by cold and by drought as well as healthy plants have been inoculated.

The possibility that those trees which flush earliest in the spring may be the last to harden in the fall and may be more susceptible to early frost than adjacent late-flushing trees is being investigated.

While leader diebacks have in the past caused only limited damage, it is noteworthy that following unusually low temperatures in 1955, extensive damage and mortality have been observed in localized areas. Genetic differences between individual trees would contribute in part to the random distribution of this damage. While this damage cannot be specifically related to the cold period, it probably results from it. The effect of this environmental condition on both the host and on the normal fungi of the area remains unknown.—W. A. Porter.

The Spruce Budworm Infestation in the Lillooet and Fraser River Areas.—The spruce budworm infestation in the Lillooet and Fraser River areas was first reported in 1953, and has been under close observation since 1954. The principal host is Douglas fir. In 1954 the outbreak was restricted to the Lillooet River and Lake area, and a smaller area in the Nahatlatch-Fraser river valleys (G. T. Silver and M. G. Thomson, Bi-Mon. Progr. Rept. 10(5): 2-3. 1954). The infestation has increased in size, and in 1957 extended along the Lillooet River and Lake, westward as far as Tisdall, northeast from Pemberton to D'Arcy, along the Anderson and Seton lakes to Lillooet and down the west side of the Fraser River Valley as far as Askom Mountain. The area of the outbreak in 1957 was calculated at 498 square miles compared with 452 square miles in 1956 and 379 square miles in 1955. The area for 1957 does not include the Anderson or Nahatlatch River valleys where the outbreak has subsided, nor a small area near Pavilion Mountain where spruce budworm populations increased considerably this year but defoliation was too light to map.