and to locate areas requiring chemical control. To reduce sampling cost is most desirable, and the following proposal is one method of reducing cost and increasing efficiency.

Washing foliage with a mild chemical solution is an established technique for collecting and counting arthropods (Strickland. *In* Annu. Rev. Entomol. 1961. p. 207). We found that overwintering second-instar spruce budworm larvae can be effectively extracted from balsam fir foliage with a 5% solution of NaOH. The technique consisted of clipping sample branches and immersing the twigs in the solution for 10 to 12 hr. The twigs were then agitated vigorously and the solution poured through a series of three sieves. Twigs and needles were extracted in the larger sieves, and the finest, 0.20 mm, retained the larvae and small bits of bark. The twigs and needles were then washed in water and this wash was also poured through the finest sieve. The effluent was filtered with a water-operated pump and examined microscopically. Caution was exercised in handling the solution. The same solution was used up to five times but the effect of dilution requires investigation.

Three extraction trials were conducted. Small balsam fir twigs with a total of 85 second-instar larvae in staminate flower bracts were immersed in the NaOH solution for 5 to 20 hr. In less than 5 hr the webbing of the hibernacula dissolved and 88% of the larvae dropped from the twigs. All larvae were extracted after 10 hr, and some larval deterioration occurred in 15 hr.

In the second trial, mid-crown branches were collected in October 1967 from balsam fir in the Green River area where the spruce budworm was known to be extremely scarce. These samples were stored at 25 F, and extracted in March, 1968. Counts from 132 branches were: 0.17 spruce budworm larvae per branch; 3.2 black-headed budworm eggs per branch (see Condrashoff, Can. Entomol. 99: 300-303. 1967); and 0.18 *Evagora* spp. larvae per branch. Current shoots on 1500 branches collected from the same location had been examined in the conventional manner in 1967 and 0.02 third-instar larvae were found per branch. The count of 0.17 second-instar larvae in the 1968 generation is within the density range that would be expected from a count of 0.02 third-instar larvae in the previous generation.

For the third trial six mid-crown branches from each of five trees were collected in a budworm infested area in March 1968. Three of the branches from each tree were washed in NaOH and gave the following results:

Tree:	1	2	3	4	5
Total budworm:	264	249	194	279	257

The remaining three branches from each tree were suspended in a controlled light and temperature regime and living larvae were forced from hibernation. When emergence was complete the foliage from two of the five trees was washed in NaOH.

Tree:	1	2	3	4	5
Larvae emerged:	113	82	57	35	24
Larvae washed:	*130*	*151*			
Total budworms:	243	208			

Forced emergence from these samples was unexpectedly low, but a comparison of the data shows close agreement in the total budworms collected from Tree 1 and Tree 3.

The washing technique was also tested against the forced emergence of larvae from hibernacula by E. G. Kettela of this laboratory. Two branches were collected from each of two trees at each of three locations approximately 1 week before emergence was expected in the field. The results were:

Location:	1	2	3
Larvae emerged:	354	58	210
Larvae washed:	305	42	111

The counts from locations 1 and 2 are comparable, and it is suspected that the two-fold difference in location 3 is partly the result of tree to tree variation in density.

These preliminary tests indicate that:

(a) Washing foliage in a 5% solution of NaOH for 10-12 hr is a reliable technique for extracting almost all overwintering spruce budworm larvae.

(b) The sampling cost is relatively low. On the average a mid-crown balsam fir branch requires approximately 100 min to count budworm eggs, 45 min to count small larvae in new shoots, and 10 min to examine the NaOH filtrate.

(c) The second instar can be sampled from mid-September to mid-April; no other developmental stage is numerically stable for so long a period.

(d) The technique is especially applicable to sparse populations where large amounts of foliage must be sampled to attain accuracy and precision.—C. A. Miller and G. A. McDougall, Forest Research Laboratory, Fredericton, N. B.

Log Preference Studies on *Tetropium velutinum* LeConte—Studies were undertaken at Trinity Valley, B.C., to determine if trees felled early in the winter were as subject to attack and damage by *Tetropium velutinum* LeConte as those felled during the spring. One western larch tree [*Larix occidentalis* Nutt.], about 14 inches dbh, was felled each month from November 1966 to June 1967. In the spring of 1967, six sections, each 2 feet in length, were cut from the bole of each tree and placed at random in an east-west direction on the forest floor.

When the log sections were debarked in the fall of 1967 all *Tetropium* larvae had not yet bored into the wood; there was an average of 0.3 to 2.0 living larvae in each square foot of bark. However, woodpeckers had removed larvae disproportionately from the bolts and the significance of living larvae in or under the bark is questionable. The average number of entrance holes of *Tetropium* larvae in the wood, for each felling date, ranged from 0.2 to 8.4/ft^2 (Table 1). The largest number of entrance holes were in bolts from trees felled in May and June.

TABLE 1

Average number of larval entrance holes and depth of penetration in larch logs by November 1967

Date of felling	No. of holes per sq ft	Avg. depth mm
November 1966	0.2	—[a]
December	2.8	20.3
January 1967	4.3	23.0
February	5.4	23.5
March	1.3	20.0[b]
April	5.1	23.4
May	6.6	27.1
June	8.4	—[c]

[a]Inadequate number of galleries in bolts.

[b]Paired variate test used on February and March penetrations.

[c]Not examined.

Tetropium larvae penetrated radially into the wood and turned, generally, 90 degrees to excavate their pupal cells. In most cases, maximum radial penetration was reached at this turning point. Maximum depth of 120 completed galleries was measured, 20 for each tree felled from December 1966 to May 1967. Average depths of penetrations are shown in Table 1. A paired variate test used on penetrations into February- and March-felled logs indicated a significant difference.

Our data show that *T. velutinum* preferred logs felled in May and June. Penetration into logs cut in May was greater than in those cut in early winter. Examination of wood density showed that the tree felled in March had only one-half as many annual rings per inch as the others. This may account for the significant differences between the March logs and the February and April logs both in the number of larval entrance holes and the average depth of penetration in the wood. Since larch trees felled early in winter were less subject to damage by *T. velutinum* than those felled during the spring, damage would be minimized by giving priority in utilization to spring-felled trees.—H. Vanderwal and D. A. Ross, Forest Entomology Laboratory, Vernon, B.C.