

TABLE 1  
Geographical and annual variation in percent losses, deaths and total mortality of overwintering birch casebearer larvae

Area	1971-72				1972-73				1973-74			
	Total Oct. number	% loss	% death	% Total mortality	Total Oct. number	% loss	% death	% Total mortality	Total Oct. number	% loss	% death	% Total mortality
Corner Brook	348	29.3	28.7	58.0	101	39.6	29.7	69.3	71	7.0	45.1	52.1
Wild Cove Point <sup>a</sup>	552	58.0	12.1	70.1	412	42.0	23.8	65.8	—	—	—	—
Cormack	1,100	26.1	31.3	57.4	452	27.2	35.0	62.2	531	59.7	11.7	71.4
Badger	532	53.2	6.9	60.1	699	39.0	20.8	59.8	818	42.1	10.5	52.6
Gambo <sup>b</sup>	—	—	—	—	—	—	—	—	508	47.2	4.9	52.1
Weighted Average		35.7	23.1	58.8		36.1	26.2	62.3		47.0	10.6	57.6

<sup>a</sup> Eliminated in '73-74 because the site became a public campground.

<sup>b</sup> An area newly infested by the birch case bearer.

larvae could be used in forecasting expected damage.

Study areas were located at Corner Brook, Wild Cove Point, and at Cormack in western Newfoundland; at Badger in central Newfoundland; and at Gambo in eastern Newfoundland. Four branch crotches were marked for sampling on each of 10 white birch trees, 3.7-5.5 m high, chosen at random in each study area by the nearest-tree bearing method with 15 m between trees. These sample crotches were chosen, one each per quarter of crown height, and at a position halfway between the stem and the crown perimeter. The number of cases were totalled for the 10 trees in each study area in October, and again in the succeeding May and June. Branch crotches containing more than 100 cases were not selected because experience indicated that such high numbers could not be counted accurately. Cases present in May contained both living and dead larvae, and any decrease from the October number was termed "overwintering losses". The number of cases present at the overwintering site in June, after live larvae had moved to the feeding sites, was termed "overwintering deaths". The sum of the "overwintering losses" and "overwintering deaths" was termed "overwintering mortality", and expressed as a percent of the October totals for each area. Data were transformed to  $\arcsin \sqrt{\text{percent}}$  before regression analyses.

The variation between areas within any given year ranged from 57-70% in 1971-72, from 60-69% in 1972-73, and from 52-71% in 1973-74. The average was about 60% in each year for all areas combined (Table 1). Regression analysis showed no correlation between number of larvae and percent "overwintering losses" percent "overwintering deaths" or percent "overwintering mortality". Consequently it appears that population density had no influence on mortality of overwintering birch casebearer larvae.

There are no data available to determine the causes of "overwintering losses" and "overwintering deaths". However, bird predation may be a cause of "overwintering losses" and snow crystals, especially when driven by high-velocity winds, may contribute to both "overwintering losses" and "overwintering deaths". The results of the study indicate that estimates of fall population levels have some potential for use in forecasting casebearer damage in the succeeding year, because total overwintering mortality appears to be fairly constant. However, I have not tested the accuracy of such a forecasting system.—A. G. Raske, Newfoundland Forest Research Centre, St. John's, Nfld.

**European Pine Shoot Moth on Ponderosa Pine in British Columbia.**—*Rhyacionia buoliana* (Schiffmueller), reported from eastern North America in 1914, was first found in the west in 1926, at Victoria. It has since become established on ornamental pines throughout the lower Fraser Valley on the mainland, and was collected in the Okanagan Valley in 1962. Infested plants are the most common means of dispersal and,

since 1964, several transfers of *R. buoliana* to Interior British Columbia have occurred. In each instance, the trees were destroyed or thoroughly pruned, sprayed and kept under observation. With the rapidly expanding market for pine and the increased use of plantation stock, quarantine regulations have been updated in an effort to prevent further distribution of *R. buoliana*. The climate of the southern Interior, particularly in the semi-arid areas of native ponderosa pine [*Pine ponderosa* Lawson], seems to permit survival of the pest, which can withstand air temperatures down to  $-29^{\circ}\text{C}$ , and lower under snow cover.

Although ponderosa pine is attractive to European pine shoot moth under nursery, plantation and experimental conditions, only a single specimen was collected on naturally growing trees prior to 1974. During May 1974, a heavy infestation of European pine shoot moth was found on mountain pine [*P. mugo* Turra] and Austrian pine [*P. nigra* Arn.] at Castlegar, in the southwest section of the Kootenay region — a substantial eastward extension. Approximately 140 trees in a small landscape area were involved. These were severely pruned and sprayed. An initial examination of nearby natural ponderosa pine of varying ages yielded six *R. buoliana* larvae. However, a later, more detailed examination of an area extending up to 3.2 km (2 miles) from the infested exotics yielded no trace of the pest. No evidence of old shoot moth damage was found on ponderosa pine even though the insect had apparently been active on the ornamentals since their planting in 1968. Annual minimum temperatures from 1960 to 1974 ranged from  $-12$  to  $-18^{\circ}\text{C}$ , and snowfall at the site was meagre. Possibly the vigorous growth of the trees at Castlegar created a natural insect control through their copious resin flow.

One of the six larvae collected from *P. ponderosa*, one was crushed, one preserved and four developed to pupae. The pupae were small and not robust, and although they appeared otherwise healthy, no adults emerged.

During June, the flight period, 35 hormone-attractant traps were set out at Castlegar among ornamental and nearby ponderosa pine stands. Only two moths were recovered: one at the Austrian pines and the other in a ponderosa area about 0.4 km north of where three larvae had been collected previously. This ponderosa pine site will be monitored to determine if a population of the pest develops. Meanwhile, the European pine shoot moth is not considered to be an economic threat to ponderosa pine in British Columbia.—D. Evans, Pacific Forest Research Centre, Victoria, B.C.

**Disruption of Mating Behavior of the Spruce Budworm in Air Permeated by Synthetic Sex Attractant.**—Lepidopterous sex attractants have two potential uses for the economic entomologist: as bait to lure males to traps, either to prevent mating and so regulate subsequent population levels, or to monitor population changes; and as agents for disrupting mating