Estimating the Number of Eggs in Spruce Budworm Egg Masses in Newfoundland.—The present outbreak of the spruce budworm, *Choristoneura fumiferana* (Clem.), in Newfoundland and Labrador began in 1971 and has become the largest and most severe infestation ever recorded in the Province. Previous outbreaks of this insect were only of minor importance. Studies were initiated in 1972 on the biology and population behavior of the budworm to explore and, hopefully, to explain the differences from previous outbreaks and to facilitate the forecast of population levels and subsequent damage.

Egg-mass surveys are routinely used for predicting spruce budworm larval population levels and subsequent defoliation (Morris, Can. J. Zool. 32:302-313, 1954). However, the size of the egg mass and, consequently, the number of eggs per mass vary considerably (Miller, Can. J. Zool. 35:1-13, 1957; McKnight, USDA Forest Serv. Res. Note RM-146, 1969; Washburn and Brickell, USDA Forest Serv. Res. Pap. INT-138, 1973), and this may influence prediction. Egg-mass surveys used elsewhere for predicting larval population levels were adopted in Newfoundland (Bryant and Clark, Bi-mon. Res. Notes 31:12, 1975), but egg-mass size and variation in the number of eggs per mass were not determined.

This note presents data on the size of egg masses and the number of eggs per mass oviposited on balsam fir, *Abies balsamea* (L.) Mill., in Newfoundland. A total of 49 egg masses was collected in 1974 and of 121 egg masses in 1975 from 50-cm-long branch tips taken from the midcrown of dominant balsam fir trees in western Newfoundland after larval eclosion was completed. To facilitate the counting, the masses were stained by soaking in 1% aqueous solution of cotton blue for 10 seconds followed by washing for 5-10 seconds (destaining) in distilled water. This method gave better results than that described by Jennings and Addy (J. Econ. Entomol. 61:1766, 1968) and later modified by Leonard, Simmons, and Van Derwerker (J. Econ. Entomol. 66:992, 1973). The length and width of each egg mass were measured to the nearest 0.01 mm with an ocular micrometer on a stereomicroscope, and the number of rows in the egg mass and the number of eggs (chorions) in each row were counted. Linear regression analyses were used to relate the number of eggs per mass to the length or width of the egg mass separately for egg masses having two, three, and four rows of eggs.

Twenty-four percent of the masses examined contained two rows, 67% had three rows, and 9% had four rows of eggs. Length of masses ranged from 2.5 to 9.2 mm and averaged 5.2, 5.3, and 5.3 mm for masses containing two, three, and four rows of eggs, respectively. Miller (1957) reported that egg masses on balsam fir in New Brunswick generally had two complete rows of eggs and a partial third row, and the length varied from 2 to 9 mm. In Minnesota, Bean (J. Econ. Entomol. 54:1064, 1961) found that spruce budworm egg masses on balsam fir usually comprised two or three rows of eggs varying from 2 to 10 mm in length. Bean (1961) also reported a skewed frequency distribution of the egg-mass lengths and therefore cautioned against using an average number of eggs per mass for population studies. In the present study, the mean versus median lengths were 5.2 vs. 5.1 mm for two-row masses, 5.3 vs. 5.4 mm for three-row and 5.3 vs. 5.0 for four-row masses, indicating that the difference between the mean and median egg-mass length is negligible. The average number of eggs for masses with two, three, and four rows of eggs was 20, 26, and 34, respectively. The average length for all egg masses (n = 170), in the present study, was 5.2 mm and the average number of eggs per mass was 25. This is higher than the 15.7 in severe infestations and the 18.5 in light infestations reported by Miller (1957). It should be noted, however, that the average number of eggs given by Miller (1957) was based on 996 and 7,429 egg masses, respectively.

Regression analyses showed that egg-mass length provided a better estimate of the number of eggs per mass than egg-mass width. The former explained 68% of the variance and the latter up to 25% of the variance.

The number of eggs per mass was predicted from regression equations for egg masses measuring from 1 to 9 mm in length and containing two, three, or four rows of eggs (Table 1). These predicted numbers of eggs are in fair agreement with the regression estimates for two- and three-row egg masses from Minnesota (Bean, 1961) but are different from the estimates presented for two-row, two-row with a partial third row, and three-row egg masses from Maine (Leonard, Simmons, and Van Derwerker, 1973), and from the estimates for two-row with a partial third row egg masses from New Brunswick (Miller, 1957). Therefore, the number of eggs per mass predicted from the regression equations in this study will be used provisionally. The accuracy of the equations will be tested for egg masses from infestations of different ages in balsam fir, and in black and white spruce stands at various locations across the Island.

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TABLE 1

Estimated number of spruce budworm eggs per mass based on length of egg mass and number of rows of eggs

Length of mass (mm)	Number of eggs		
	Two-row[a]	Three-row[b]	Four-row[c]
	egg mass		
1	3	4	5
2	7	9	12
3	11	14	19
4	15	19	25
5	19	24	32
6	23	29	38
7	27	34	45
8	31	39	52
9	35	44	58

[a] $Y = -0.75 + 3.94X$; $r^2 = 0.68$

[b] $Y = -1.27 + 5.04X$; $r^2 = 0.67$

[c] $Y = -1.06 + 6.54X$; $r^2 = 0.68$

Insects Inhabiting Wood-chip Stockpiles in British Columbia.—Massive populations of insects in wood-chip stockpiles in British Columbia have been reported to the Forest Insect and Disease Survey at Victoria during the past several years. They have occurred through the central logging area of the southern interior at Quesnel, Williams Lake, 100 Mile House and Kelowna. Large quantities of chips were involved and there was a considerable diversity of insects. The main food source was the meso- and thermophilic microfungi which develop quickly with the changes in temperature and humidity during the various phases of chip degradation. Outstanding characteristics of the insects were their small size (1.5-3.0 mm), their incredible numbers —approximately 1,100 adults / liter (1 qt) of chips—and the short time apparently required for the populations to materialize. Populations are known to persist for at least 2 years and presumably could continue as long as their environment remained suitable. The insects caused no appreciable problems in the further processing of the chips for pulp production, as indicated by commercial laboratory tests and in actual utilization (pers. comm.).

Hereunder are given the localities, collection data, species, status, and relative abundance of the insects recovered. The individual collections show the insect associations; within them the species are listed in order of abundance. Carabids and staphylinids were identified at the Biosystematics Research Institute; other identifications were made by the author. Percentages are based on chip samples of approximately 3 liters, each containing 3,300± insects.

100 Mile House, June 29, 1971; chip stockpile: *Silvanus bidentatus* (Fabricius) (Coleoptera: Cucujidae) — a fungus feeder, 100% (no other insects found). Kelowna, Nov. 4, 1975; 25,000 BDU* spruce-pine chip stockpile (*bone-dry units: 1 020 kg [2,250 lb] dry weight), spot infestations throughout, wherever temperature and humidity were high: *Tachys nanus* Gyllandel (Coleoptera: Carabidae) — vegetarian, 91%; Arachnida (spiders) — predator, 3%; Staphylinidae (Coleoptera) — predator-scavenger, 2%; *Atheta* sp. (Staphylinidae) — predator-scavenger, 1.5%; *Metaclisa marginicollis* (Horn) (Coleoptera: Tenebrionidae) — vegetarian scavenger, 1%; *Falacria*