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Insect pests of wild cranberry, Vaccinium macrocarpon, in Newfoundland and Labrador
Les insectes de la canneberge sauvage, Vaccinium macrocarpon, à Terre-Neuve et Labrador

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Article abstract

Cranberry (*Vaccinium macrocarpon*) has been commercially developed since the late 1990's in Newfoundland and Labrador. At that time, the insect fauna of the extensive stands of native, wild cranberry was not known, although these might provide a reservoir for pests to move to commercial sites. The occurrence and distribution of cranberry-feeding insects were assessed in wild stands to help cranberry growers prepare for the insect pests they might have to manage. Adults of the cranberry fruitworm, *Acrobasis vaccinii* were recovered in pheromone traps and larvae found in berries. The fruitworm was common and widespread. Moths of the cranberry girdler, *Chrysoteuchia topiaria* were caught in pheromone traps, but larvae were not recovered from plant or soil samples. There was no evidence of the black-headed fireworm, *Rhopobota naevana*, the cranberry weevil, *Anthonomus musculus*, the red-headed flea beetle, *Systena frontalis*, or the cranberry tipworm, *Dasineura oxycoccana*, serious cranberry pests in other areas. However, larvae of the lingonberry fruitworm, *Grapholita libertina*, were found infesting cranberry at one site in 1998. Of the species found in this study, *A. vaccinii* probably represents the most serious threat to the industry.

Insect pests of wild cranberry, *Vaccinium macrocarpon*, in Newfoundland and Labrador

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Cranberry (*Vaccinium macrocarpon*) has been commercially developed since the late 1990's in Newfoundland and Labrador. At that time, the insect fauna of the extensive stands of native, wild cranberry was not known, although these might provide a reservoir for pests to move to commercial sites. The occurrence and distribution of cranberry-feeding insects were assessed in wild stands to help cranberry growers prepare for the insect pests they might have to manage. Adults of the cranberry fruitworm, *Acrobasis vaccinii* were recovered in pheromone traps and larvae found in berries. The fruitworm was common and widespread. Moths of the cranberry girdler, *Chrysoteuchia topiaria* were caught in pheromone traps, but larvae were not recovered from plant or soil samples. There was no evidence of the black-headed fireworm, *Rhopobota naevana*, the cranberry weevil, *Anthonomus musculus*, the red-headed flea beetle, *Systena frontalis*, or the cranberry tipworm, *Dasineura oxycoccana*, serious cranberry pests in other areas. However, larvae of the lingonberry fruitworm, *Grapholita libertina*, were found infesting cranberry at one site in 1998. Of the species found in this study, *A. vaccinii* probably represents the most serious threat to the industry.

[Les insectes de la canneberge sauvage, *Vaccinium macrocarpon*, à Terre-Neuve et Labrador]

La canneberge (*Vaccinium macrocarpon*) a été développée commercialement à Terre-Neuve à la fin des années '90. À ce moment là, les populations d'insectes indigènes dans les cannebergières sauvages étaient peu connues, même si ces lieux pouvaient servir de réservoir aux ravageurs, entraînant un déplacement de ces derniers vers les sites commerciaux. Pour aider les producteurs à faire face aux ravageurs, la présence et la distribution de ces insectes ont été évaluées dans les cannebergières sauvages. Des adultes de la pyrale des atocas, *Acrobasis vaccinii* ont été capturés dans des pièges à phéromone alors que des larves ont été trouvées dans les fruits. La pyrale des atocas est un ravageur commun et répandu. Des adultes de l'anneleur de la canneberge, *Chrysoteuchia topiaria* ont été capturés dans les pièges à phéromone mais aucune larve n'a été retrouvée dans les plants ni dans les échantillons de sol. Il n'y a pas

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d'évidence de la présence de la tordeuse des canneberges, *Rhopobota naevana*, du charançon des atocas, *Anthonomus musculus*, de l'altise à tête rouge, *Systena frontalis*, ou de la cécidomyie des atocas, *Dasineura oxycoccana*, lesquels sont retrouvés ailleurs. Cependant, une infestation par les larves de *Grapholita libertina*, a été observée dans la canneberge, sur un site en 1998. De toutes les espèces trouvées lors de cette étude, la pyrale des atocas est probablement la principale menace pour cette industrie.

INTRODUCTION

The cranberry industry in Newfoundland and Labrador is young, with five, five-hectare commercial sites established since 1998. There is potential for expansion on the approximately 2 000 000 ha of open, unforested peatland (Woodrow 1990), typical habitat for the two common species of native wild cranberry, *Vaccinium macrocarpon* Aiton, and *Vaccinium oxycoccus* L. [Ericaceae] (Hendrickson 1998). As cranberry has not been previously cultivated, it was considered that at least the island part of the province may not have some of the insect pests which occur elsewhere on cultivated cranberry. To minimize the introduction of foreign pests, commercial bogs were established using tissue-cultured plants and the import of potentially-infested «bales» of cranberry vines is not allowed. However, many of the most serious insect pests in areas with a longer-established commercial industry (e.g. Quebec, Massachusetts), are native to North America and originally invaded cultivated plantings from wild cranberry stands.

Little is known about the insect fauna of wild cranberry bogs in Newfoundland, although a number of species considered minor pests of cranberry have been recorded from other host plants (Dixon *et al.* 2000). These include *Xylena nupera* (Lintner) and *Epiglaea apiata* (Grote) [Lepidoptera: Noctuidae], *Otiorhynchus ovatus* (L.) and *O. sulcatus* (Fabr.) [Coleoptera: Curculionidae], and *Phyllophaga anxia* (LeConte) [Coleoptera: Scarabaeidae]. These are commonly known as the false armyworm, the cranberry blossomworm, the strawberry root weevil, the black vine weevil and the June beetle, respectively. All are omnivorous species which can become cranberry pests in commercial monoculture (Averill and Sylvia 1998). The objective of this study was to determine the species present in wild cranberry, and their geographical distribution.

MATERIALS AND METHODS

Site Selection

A total of 15 sites across the island part of Newfoundland and Labrador were studied between 1998 and 2000 (Table 1, Fig. 1). Sites were selected based on an abundance of native cranberry, or by proximity to bogs being developed for cultivated cranberry. If native cranberries were not present at sites adjacent to commercial cranberry, areas were selected which had abundant marshberry (*V. oxycoccus*), blueberry (*V. angustifolium* Aiton) or lingonberry (*V. vitis-idaea* L. var. *minus* Lodd) [Ericaceae], alternative hosts for *Acrobasis vaccinii* Riley [Lepidoptera: Pyralidae]. There were approximately 2 ha of mixed wild *Vaccinium* spp. at each site, except at Pynn's Brook, Renews and Wooddale which each had about 0.5 ha. No sites were selected in Labrador, as there were no plans for commercial cranberry development there at the time.

Pheromone trapping, soil and plant samples

1998 - Pheromones were used to monitor *Rhopobota naevana* (Hübner) [Lepidoptera: Tortricidae] ((Z)-11-tetradecen-1-ol-acetate, (E)-11-tetradecen-1-ol-acetate and (Z)-11- tetradecen-1-ol) and *Chrysoteuchia topiaria* (Zeller) [Lepidoptera: Pyralidae] ((Z)-11- hexadecenal and (Z)-11-hexadecen-1-ol)). All traps, lures and pheromones were from Phero Tech Inc.®, British Columbia. Six Pherocon® 1C wing traps were used at each of the 10 sites listed in Table 1,

Table 1. Occurrence of *A. vaccinii* and *C. topiaria* in pheromone baited traps (1998, 1999 and 2000) or in berries (1998, 1999). Trapping occurred from at least mid-June until early August (none = not present in traps or berries, adult = adult in traps, larvae = larvae in berries, — = not sampled)

	1998			1999			2000	
Site	Berries examined (N)	*A. vaccinii*	*C. topiaria*	Berries examined (N)	*A. vaccinii*	*C. topiaria*	Trap catch (moths/trap/day (se)) *A. vaccinii*	*C. topiaria*
Burin[a]	38	none	none	88	none	adults	2.41 (0.6)	0.96 (0.3)
St. George's Gut	318	none	none	188	none	none	—	—
Stephenville[a]	110	none	none	110	larvae	adults	1.28 (0.3)	0.01 (0.0)
Pynn's Brook	0	none	none	0	none	none	none	0.01 (0.0)
New Melbourne	2986	larvae	none	4284	larvae + adults	none	—	—
Fischel's River	0	none	none	—	—	—	—	—
Fermeuse	2048	none	none	—	—	—	—	—
Lamaline	206	none	none	—	—	—	—	—
Renews	333	none	none	—	—	—	—	—
Wooddale	88	none	none	—	—	—	1.30 (0.3)	0.35 (0.3)
Terra Nova[a]	—	—	—	80	adults	adults	0.77 (0.2)	0.01 (0.0)
Deadman's Bay[a]	—	—	—	217	adults	adults	2.82 (0.7)	none
Rushy Pond	—	—	—	310	none	none	—	—
Flat Bay[a]	—	—	—	58	adults	adults	—	—
Salmonier	—	—	—	—	—	—	none	0.01 (0.0)

[a] Sites near commercial cranberry development.

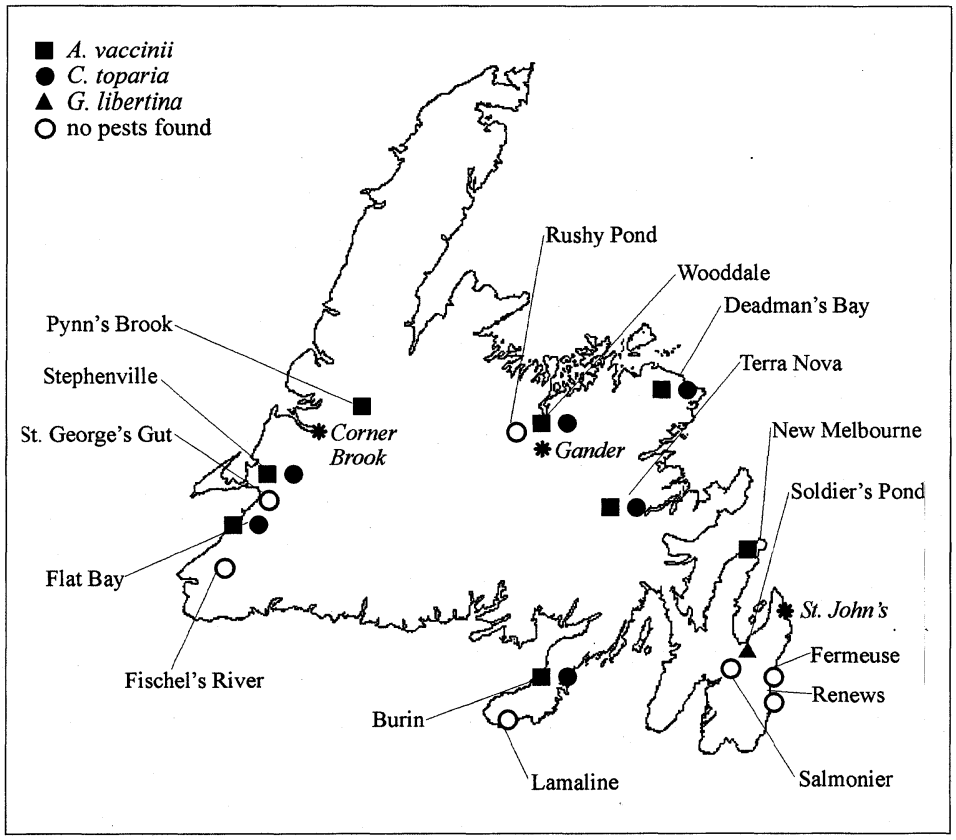

Figure 1. Map of insular Newfoundland indicating occurrence of the cranberry fruitworm, *A. vaccinii*, and the cranberry girdler, *C. topiaria* during 1998-2000. The lingonberry fruitworm, *G. libertina*, was found infesting cranberry at one site.

three baited with *R. naevana* pheromone and three with *C. topiaria* pheromone. Traps were spaced 20 m apart, placed in the field in early summer and collected at the end of the field season. Most traps were not checked during the season due to the number of sites and the distance (initial set-up took several d travel). Fermeuse and New Melbourne were sampled more intensively with traps collected every 7-10 d from 3 June to 28 August. Lures were not changed during the trapping period, but bottoms were replaced if they were saturated or damaged.

At each site, cranberry plants which appeared unhealthy were removed along with three to four liters of surrounding soil. A total of 14 plant and soil samples across all sites were examined visually for insect pests and damage, and insects were extracted using Berlese funnels (Martin 1977). Four samples were taken from New Melbourne, and two from each of Burin, St. George's Gut, Fermeuse, Fischel's River, and Renews. Berry samples were taken randomly between 17 and 30 August, and examined for insects and damage. Sample size varied according to the number of berries present (Table 1). At Burin, Stephenville, Terra Nova, Deadman's Bay and Flat Bay, *V. macrocarpon* was not present, so berries were taken from *V. oxycoccus* or *V. vitis-idaea*. Berries were not sampled at Fischel's River, as the area was flooded.

1999 - Pheromone traps, and soil and plant samples were collected as in 1998, at nine sites as indicated on Table 1.

However, pheromones also were used to monitor *A. vaccinii*. *Acrobasis vaccinii* lures ((E,Z)-8,10-pentadecadien-1-ol acetate and (E)-9-pentadecen-1-ol acetate) were obtained from Great Lakes IPM® in Michigan. At New Melbourne, traps were sampled weekly, with two traps used for each of the three pheromones. Soil and plant samples were taken from apparently unhealthy plants (n = 14) at New Melbourne only, and assessed as previously described. Berry samples were also taken as in 1998 (Table 1).

2000 - Acrobasis vaccinii, C. topiaria and *R. naevana* were monitored at seven sites using pheromone traps (Table 1). Three traps for each species were placed near three cultivated cranberry sites (Terra Nova, Stephenville, Burin), and three government test plots (Wooddale, Salmonier and Pynn's Brook), for a total of nine traps per site. At Deadman's Bay, there were four traps for *A. vaccinii*, and thus a total of 10 traps. Every 2 wk between 7 July and 30 August, traps were collected and sent to Agriculture and Agri-Food Canada in St. John's for assessment. Lures were not changed during the trapping period. No soil, plant or berry samples were taken in 2000.

RESULTS AND DISCUSSION

1998

Chrysoteuchia topiaria and *R. naevana* moths were not found in pheromone traps. *Acrobasis vaccinii* larvae were found in several berries collected at New Melbourne, the first record of this species in the province. Damaged berries collected in Fermeuse had damage characteristic of *A. vaccinii* but larvae had exited so positive determination was not possible. No evidence of insects or feeding was observed in plant samples and no insects were found in the soil. A small number of larvae of the lingonberry fruitworm, *Grapholita libertina* Heinrich [Lepidoptera: Tortricidae], were present in cranberries collected at Soldier's Pond (21 larvae in 600 berries). The usual host of *G. libertina* is *V. vitis-idaea* var. *minus* (Hillier *et al.* 2002; Morris *et al.* 1988). This insect was recovered from cranberry only from this site, and the record may be due to the coincident occurrence of wild lingonberries and cranberries.

1999

Large numbers of *A. vaccinii* and *C. topiaria* moths were trapped at New Melbourne, an area with abundant native cranberry but not near a commercial bog. Pheromone trapping at other wild sites also indicated the presence of both species (Table 1), suggesting they are widely distributed. Cranberry pests were not found in soil or leaf samples, from any of the nine sites. However, *A. vaccinii* larvae were found in large numbers in berries collected from New Melbourne. A single *A. vaccinii* larva was also found in a *V. oxycoccus* sample near the Stephenville site; *V. oxycoccus* is a reservoir host for this pest (N.K. Hillier, personal observation). While *C. topiaria* moths were present in pheromone traps at five sites, larvae were not recovered from any site. Samples of wild cranberry plants were typically heterogenous, often mixed among other wild plants. The aggregation of roots, runners, lichens and moss created difficulty in both taking and examining soil samples. Also, because *C. topiaria* prefers grass roots to cranberry (Averill and Sylvia 1998; Kamm and McDunough 1989), it is possible that larvae were not feeding on cranberry in wild stands and thus were not recovered.

Acrobasis vaccinii moths were recovered from pheromone traps from 7 to 28 July at New Melbourne and larvae were present in berries from 21 July to 9 September. *Acrobasis vaccinii* larvae were present in 23-36% of sampled berries at New Melbourne.

2000

Pheromone trapping confirmed the broad distribution of *A. vaccinii* and *C. topiaria* (Table 1). The highest number of *A. vaccinii* was collected at Deadman's Bay, with 1174 moths in four traps over the trapping period (average = 2.82 ± 0.7 moths/trap/day). *Acrobasis vaccinii* were found in traps at all sites except Salmonier and Pynn's

Brook, two of the new commercial bogs with minimal wild cranberry in the area to act as a pest reservoir. *Chrysoteuchia topiaria* was collected in small numbers at all sites except Deadman's Bay (Table 1). The highest number was trapped at Burin, with 238 moths in four traps over the sampling period (average = 0.96 ± 0.3 moths/trap/day).

During 1998 and 1999, the efficiency of the traps at several sites may have been decreased due to placement in the field for 6-8 wk without being checked. Catches may have been affected by saturation of trap bottoms or deterioration of trapped moths making identification difficult. Lure age also may affect trapping through decreasing emission rates over time (Housewart *et al.* 1981). The field life of the pheromone lures used in this study is approximately 6-8 wk (J. Hansel, personal communication), so decreased emission rates should not have influenced catches. Cranberry pests were found in 1999 but not 1998, at two (Burin and Stephenville) of the five sites monitored in both yr. As methods were the same in 1998 and 1999, presumably there were fewer insects present in the first yr at those sites, or catches were influenced by abiotic factors such as weather.

This study, along with previous museum records, confirms the presence of a number of cranberry-feeding insects in Newfoundland. Records from the Agriculture and Agri-Food Canada-St. John's insect collection, among others, show that *O. ovatus* and *O. sulcatus* are common and widely distributed, and *P. anxia* is present in the west and central areas of the island. Larvae of each of these beetle species are omnivorous root-feeders, potentially causing extensive damage to a range of crops including cranberry (Averill and Sylvia 1998). *Epiglaea apiata* is also widely distributed across the island but is uncommon (Morris 1980); its status may change as commercial cranberry develops. Collection specimens indicate that *X. nupera* also is uncommon, apparently restricted to the Avalon Peninsula (Morris 1980).

Grapholita libertina larvae were found in wild cranberries at one site in 1998. If larvae moved from lingonberries to adjacent wild cranberries, cranberries cultivated in monoculture may not be at risk. Otherwise, *G. libertina* may be a potential pest of commercial cranberry in Newfoundland and Labrador, where both *V. vitis-idaea* and *G. libertina* are common and ubiquitous, and in Nova Scotia and British Columbia, where the tortricid also occurs (Morris *et al.* 1988).

The current study indicates that *C. topiaria* and *A. vaccinii* are widespread. Previous *C. topiaria* specimens held in the Agriculture and Agri-Food Canada-St. John's collection indicate that it occurs throughout insular Newfoundland and has been recovered from one location in Labrador. Although *C. topiaria* larvae prefer the roots of grasses to those of cranberry, they can cause severe damage in cranberry by feeding on subterranean vines (Roland 1990).

The pest of most potential concern is *A. vaccinii*. This paper represents the first record of this species for the province. *Acrobasis vaccinii*'s host range is narrow, restricted to a few species related to cranberry (*Vaccinium*) and huckleberry (*Gaylussacia*); wild stands of these plants are common near cranberry-development areas, and provide reservoirs for pests. *Acrobasis vaccinii* is considered a serious pest of cranberry in both cultivated and wild bogs, with 50-80% loss of fruit in unmanaged areas (Brodel and Roberts 1984; Maxwell and Morgan 1951). Although currently found in Newfoundland only in wild stands, it is inevitable that *A. vaccinii*, as well as other pest species, will invade commercial plantations.

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REFERENCES

Averill, A.L., and M.M. Sylvia. 1998. Cranberry insects of the Northeast. University of Massachusetts, Amherst, Massachusetts. 112 pp.

Brodel, C.F., and S.L. Roberts. 1984. The cranberry fruitworm. Publication 1-08-84-2M of the Cranberry Experiment Station, East Wareham, Massachusetts, 2 pp.

Dixon, P.L., P. Hendrickson, N.K. Hillier, and G. Porter. 2000. Insects on wild cranberry in Newfoundland. 1999 Cranberry Research Compilation 11 : 89-92. Cranberry Institute, Wareham, MA.

Hendrickson, P. 1998. Cranberry development strategy for Newfoundland and Labrador. Department of Forest Resources and Agrifoods, St. John's, Newfoundland, 18 pp.

Hillier N.K., P.L. Dixon, W.D. Seabrook, and D.J. Larson. 2002. Field testing of synthetic attractants for male *Grapholita libertina* (Lepidoptera: Tortricidae). Can. Entomol. 134 : 657-665.

Housewart M.W., D.T. Jennings, and C.J. Sanders. 1981. Variables associated with pheromone traps for monitoring spruce budworm populations (Lepidoptera: Tortricidae). Can. Entomol. 113 : 527-537.

Kamm, J.A., and L.M. McDunough. 1989. Field tests with the sex pheromone of the cranberry girdler. Environ. Entomol. 8 : 773-775.

Martin, J.E.H. 1977. The insects and arachnids of Canada. Part 1: Collecting, preparing, and preserving insects, mites and spiders. Publication 1643, Agriculture Canada, Ottawa, Ontario, 182 pp.

Maxwell, C.W., and G.T. Morgan. 1951. Life-history studies of the cranberry fruitworm, *Mineola vaccinii* (Riley), in New Brunswick (Lepidoptera: Pyralidae). 82nd Annu. Rep. Entomol. Soc. Ontario, Ontario, Canada, pp. 21-25.

Morris, R.F. 1980. Butterflies and moths of Newfoundland and Labrador: the Macrolepidoptera. Agriculture Canada Publication no. 1691, St. John's, Newfoundland, 407 pp.

Morris, R.F., B.G. Penney, G. Greenslade, P.A. Hendrickson, and K.B. McRae. 1988. Notes on the occurrence, distribution, population levels and control of *Grapholita libertina* Heinr. (Lepidoptera: Tortricidae), a pest of lingonberries in Newfoundland. Can. Entomol. 120 : 867-872.

Roland, J. 1990. Use of alternative plant species as a monitoring tool for the cranberry girdler (Lepidoptera: Pyralidae). Environ. Entomol. 19 : 721-724.

Woodrow, E. 1990. Vegetable crop suitability of organic soils in Newfoundland. Land Resource Research Centre, Agriculture Canada, contribution no. 90-54, St. John's, Newfoundland, 9 pp.