



The Byrrhidae (Coleoptera) of Atlantic Canada

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ABSTRACT

The present paper surveys the moss beetle (Coleoptera: Byrrhidae) fauna of Atlantic Canada. Ten species are now known to occur in the region. Fourteen new jurisdictional records are reported including two species, *Byrrhus geminatus* LeConte and *Porcinolus undatus* (Melsheimer), which are newly recorded in the region. A key to the identification of species found in Atlantic Canada is provided, as are distribution maps and colour habitus photographs. The distribution, bionomics, and phenology of all species are briefly recounted.

RÉSUMÉ

Cet article recense les Byrrhidés (Coleoptera: Byrrhidae) du Canada Atlantique. Jusqu'à présent, on a dénoté la présence de dix espèces dans la région. Quatorze additions à la faune juridictionnelle sont rapportées, incluant deux espèces, *Byrrhus geminatus* LeConte et *Porcinolus undatus* (Melsheimer), décrites pour la première fois dans la région. Une clé d'identification des espèces retrouvées au Canada Atlantique est fournie, de même que des cartes de distribution et des photographies couleurs de l'habitus. La distribution, la bionomie et la phénologie de toutes les espèces sont brièvement relatées.

INTRODUCTION

The Byrrhidae (moss or pill beetles) is a family of obligate moss feeding (adults and larvae) beetles (Johnson 2002). Species of Byrrhidae inhabiting mesic coniferous forests are found in narrowly defined bryophyte and vascular plant communities. Byrrhids of open environments are adapted to transitional ruderal microhabitats dominated by mosses such as *Ceratodon purpureus* (L.) Brid., *Polytrichum juniperinum* Wild, *Polytrichum piliferum* Schreb. (Polytrichaceae), and sedges (*Carex* spp.) growing on moist but thin or scarified soil (Johnson 2002).

There are about 290 byrrhid species known worldwide, 35 of which are known in North America (Johnson 2002). Johnson (1990) summarized the distribution of the adventive European *Simplocaria semistriata* (Fabricius) in North America, including records from Nova Scotia and Newfoundland. Johnson (1991b) recorded 26 species in Canada, seven of which (represented by 15 provincial records) were recorded in Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador). Since then, Majka et al. (2006) added records of three species to the Prince Edward Island faunal list, including one other adventive species, *Chaetophora spinosa* (Rossi), newly recorded in the region. Subsequently, Majka et al. (2007) added additional records of *Chaetophora spinosa* from New Brunswick and Nova Scotia. The present study reports on further investigations into the byrrhid fauna of Atlantic Canada and provides a key to species of the region.

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METHODS AND CONVENTIONS

The taxonomy and nomenclature employed in this study follows that of Johnson (2002, 2004). Seven hundred and eighty specimens of Byrrhidae originating from Atlantic Canada (121 from Nova Scotia, 107 from New Brunswick, 78 from Prince Edward Island, 467 from Newfoundland and Labrador, six from Saint-Pierre et Miquelon, and one from the Îles de la Madeleine, Québec) were examined and identified. Abbreviations of collections (largely following Evenhuis 2011) referred to in the accounts below are:

ACNS	Agriculture and Agri-Food Canada, Kentville, Nova Scotia, Canada
CBU	Cape Breton University, Sydney, Nova Scotia, Canada
CFNL	Canadian Forest Service, Corner Brook, Newfoundland and Labrador, Canada
CGMC	Christopher G. Majka Collection, Halifax, Nova Scotia, Canada
CNC	Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
MUN	Memorial University of Newfoundland collection, St. John's, Newfoundland, Canada (currently on long term loan to the Canadian Forest Service, Edmonton, Alberta)
MZHF	Zoological Museum, University of Helsinki, Helsinki, Finland
NBM	New Brunswick Museum, Saint John, New Brunswick, Canada
NSAC	Nova Scotia Agricultural College, Bible Hill, Nova Scotia, Canada
NSMC	Nova Scotia Museum, Halifax, Nova Scotia, Canada
NSNR	Nova Scotia Department of Natural Resources Insectary, Shubenacadie, Nova Scotia, Canada
RWC	Reginald Webster Collection, Charters Settlement, New Brunswick, Canada
UMNB	Université de Moncton, Moncton, New Brunswick, Canada
UPEI	University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada

IDENTIFICATION

A key to species of Byrrhidae found in Atlantic Canada (adapted from Johnson 1991a, 2002) is provided on page 34.

RESULTS

As a result of an examination of specimens of Byrrhidae in collections in Atlantic Canada, fourteen new jurisdictional records are reported including two species, *Byrrhus geminatus* LeConte and *Porcinolus undatus* (Melsheimer),

newly recorded in the region (Table 1). Specific details follow.

Byrrhinae Byrrhini

Byrrhus americanus LeConte, 1850

NEW BRUNSWICK: Albert County: 3 km N of Fundy National Park: 8 June 1994, 4 July 1994, J. Julian, black spruce plantation, pitfall trap (52, NSMC); Mary's Point, 23 August 2003, C.G. Majka, coastal dunes (1, CGMC); **Gloucester County:** Bathurst, August 1978, R. Tremblay, (1, UMNB); Bathurst, June 1927, J.N. Knull (1, CNC); Bathurst, 7 August 1939, W.J. Brown (1, CNC); Daly Point, Bathurst, 16 June 1998, R.P. Webster, boggy cattail marsh (1, RWC); **Kent County:** Kouchibouguac National Park, 25 June 1979, Y. Chaisson (1, UMNB); Kouchibouguac National Park, 12 July 1977, 17 July 1977, 2 August 1977, G.A. Calderwood (5, CNC); Kouchibouguac National Park, 30 June 1977, J.R. Vockeroth (1, CNC); Kouchibouguac National Park, 7 July 1978, H. Goulet (2, CNC); **Kings County:** Grand Bay, 30 June 1990, 26 May 2001, D.F. McAlpine (2, NBM); Penobsquis, 26 July 1926, C.A. Frost (1, CNC); **Restigouche County:** Becketville, 5 July 1928, W.J. Brown (1, CNC); **Saint John County:** Saint John, 3 June 1898, 2 July 1907, June 190?, W. McIntosh (3, NBM); **Westmorland County:** locality not noted, 7 June 1974, D.B. Finnamore (1, CNC); **York County:** Charters Settlement, 19 May 2003, R.P. Webster, blueberry in mixed forest (1, RWC); Fredericton, 6 June 1926, R.P. Gorham (1, CNC); New Maryland, 3 June 2003, R.P. Webster, mixed forest, pitfall trap (1, RWC); Fredericton, 13 August 1956, N.R. Brown (1, CFNL). **NEWFOUNDLAND:** Holyrood, 10 June 1949, C.H. Lindroth (1, MZHF); Terra Nova 26-28 July 1951, C.H. Lindroth (1, MZHF); Cow Head, 9 August 1949, E. Palmen (1, MZHF); Grand Bruit, 18 June 1949, E. Palmen (4, MZHF); Lamaline, 4 August 1951, C.H. Lindroth (1, MZHF); Pass Island, 25 June 1949, C.H. Lindroth (1, MZHF); Port aux Basques, 30 June 1949, C.H. Lindroth (6, MZHF); Port aux Basques, 30 June 1949, E. Palmen (2, MZHF); Pushthrough, 22-24 June 1949, C.H. Lindroth (2, MZHF); Rencontre West, 17-19 June 1949, C.H. Lindroth (3, MZHF); Red Rocks, Table Mt., 29 June 1949, C.H. Lindroth (3, MZHF); 5 km W of Trout River Jct, 6 June 1982, D. Langor & A.G. Raske (1, MUN); Fair Haven, 19 July 1993 (1, CFNL). **NOVA SCOTIA:** 48 specimens were examined from **Annapolis, Cape Breton, Colchester, Cumberland, Halifax, Inverness, Kings, Lunenburg, Pictou, Richmond and Victoria Counties.** The earliest

1. Antennae capitate; body short (0.9–3.2 mm), shallowly to moderately convex; appendages closely retractile into deep recesses; dorsum with clavate or truncate bristles (Figures 15-16) (Syncalyptinae).....2
 – Antennae clavate; body various (2.5–9.5 mm), moderately to strongly convex; ovate to elongate; appendages not or partially received into fossae; dorsum with decumbent to erect fine setae (Figures 1,5-7,9, 10,12,14) (Byrrhinae)3
- 2(1). Dorsum with appressed scale-like setae and erect bristles (Figure 16); [length 2.9–3.2 mm].....
 *Curimopsis moosilauke* Johnson
 – Dorsum with bristles only (Figure 15); [length 0.9–2.1 mm] *Chaetophora spinosa* (Rossi)
- 3(1). Frontal margin beaded, occasionally reflexed and carinate; mesosternum strongly reduced except for median fossa; palps with ultimate segment fusiform to narrowly pyriform; metacoxae small, distant from elytral margin; elytra often connate (Simplocariini)4
 – Frontal margin rounded or truncate, not reflexed, beaded or carinate; mesosternum distinct laterad of median fossa; palps with ultimate segment compressed or cylindrically pyriform; metacoxae flattened, nearly reaching elytral margin; elytra not connate (Byrrhini)5
- 4(3). Short, ovate, slightly depressed dorsally; elytral pubescence long, moderately dense, evenly distributed; elytral striae becoming evanescent at mid-length (Figure 14); [length 2.5–2.9 mm]
 *Simplocaria semistriata* (Fabricius)
 – Elongate, ovoid; elytral pubescence tessellate; elytral striae complete or becoming evanescent pre-apically (Figure 12); [length 2.8–3.5 mm]..... *Simplocaria metallica* (Sturm)
- 5(3). Frontal margin truncate and thickened; first visible abdominal sternite without crural modifications; [length 4.0–6.5 mm]..... *Cytilus alternatus* (Say)
 – Frontal margin obtusely rounded; first visible abdominal sternite with distinct crural depressions or fossae6
- 6(5). Ovate to subparallel, strongly convex dorsally; pubescence simple, appressed (*Byrrhus*).....7
 – Ovate, shallowly convex dorsally; pubescence including erect, bristle-like setae (Figure 10); [length 4.5–5.0 mm] *Porcinolus undatus* (Melsheimer)
- 7(6). Pronotal punctures smaller, well separated on disc by interspaces greater than own diameter8
 – Pronotal punctures larger, separated by less than own diameter; [length 7.8–8.5 mm]
 *Byrrhus geminatus* LeConte
- 8(7) Pronotal and elytral integument dulled due to dense, fine to coarse, microreticulation or microrugosities; punctures small, often obliterated9
 – Pronotal and elytral integument shining between moderate-sized punctures; sparsely and finely microreticulate; [length 6.7–8.7 mm] *Byrrhus kirbyi* LeConte
- 9(8). Punctures of head coarse, confluent, rugose; similar but shallower on elytra; [length 7.5–10.3 mm] *Byrrhus americanus* LeConte
 – Punctures of head large and shallow on frons; deep and moderately dense on elytra; [length 5.8–6.5 mm] *Byrrhus cyclophorus* Kirby

Table 1. The Byrrhidae fauna of Atlantic Canada and species distributions in northeastern North America.

	NB	PE	IM	NS	NF	LB	PM	Distribution in NE North America
Byrrhinae								
Byrrhini								
<i>Byrrhus americanus</i> LeConte	1	1	1	1	1	1	1	CT, LB, MA, ME, NB, NF, NH, NS, NY, ON, PE, PM, QC, RI
<i>Byrrhus cyclophorus</i> Kirby	1			1	1	1		LB, ME, NF, NH, NY, ON, QC, VT
<i>Byrrhus geminatus</i> LeConte *	1						1	LB, ME, NB, NH, QC
<i>Byrrhus kirbyi</i> LeConte	1			1	1	1	1	LB, ME, NB, NF, NH, NS, ON, QC
<i>Cytilus alternatus</i> (Say)	1	1		1	1	1		CT, LB, ME, NB, NF, NH, NS, NY, ON, PE, QC, RI, VT
<i>Porcinolus undatus</i> (Melsheimer)	1			1				CT, MA, NB, NH, NS, NY, ON, QC, RI
Simplocariini								
<i>Simplocaria metallica</i> (Sturm) *					1	1		GR, LB, NF, ON, QC
<i>Simplocaria semistriata</i> (Fabricius) †		1		1	1			CT, ME, NH, NF, NS, NY, ON, PE, QC, RI, VT
Syncalyptrinae								
<i>Chaetophora spinosa</i> (Rossi) †	1	1		1				CT, MA, ME, NB, NH, NS, NY, ON, PE, QC, VT
<i>Curimopsis moosilauke</i> Johnson					1	1		LB, ME, NF, NH, NY, QC
Total	6	4	1	7	7	6	2	

Notes: NB = New Brunswick; PE = Prince Edward Island; IM = Îles de la Madeleine, QC; NS = Nova Scotia; NF = insular Newfoundland; LB = Labrador; PM = Saint-Pierre et Miquelon. * = Holarctic species; † = adventive Palaearctic species. Distribution in northeastern North America: ON = Ontario; QC = Québec; GR = Greenland; CT = Connecticut; MA = Massachusetts; ME = Maine; NH = New Hampshire; NY = New York; RI = Rhode Island; and VT = Vermont.

record is from 1947 [**Halifax County:** Armdale, 8 May 1947, D.C. Ferguson (1, NSMC).] **PRINCE EDWARD ISLAND:** **Kings County:** Launching, 10 August 2008, C.G. Majka, seashore (1, CGMC); **Queens County:** Mount Herbert, 16 June 1921-24, J.R. Mutch (1, UPEI). **QUÉBEC:** Îles de la Madeleine: 17 August 1986, J.A. Adams (1, NSAC). **FRANCE:** Saint-Pierre et Miquelon: Saint-Pierre, 11 August 1951, C.H. Lindroth (3, MZHF); Miquelon, 8-10 August 1951, C.H. Lindroth (1, MZHF).

Byrrhus americanus (Figure 1) is newly recorded in New Brunswick, insular Newfoundland, Prince Edward Island, the Îles de la Madeleine of Québec, and the French territory of Saint-Pierre et Miquelon (Figures 2 & 3). It was recorded from Labrador by Sherman (1910) and Casey (1912); and from Nova Scotia by Johnson (1991b). In Atlantic Canada, specimens were collected in black spruce (*Picea mariana* (Mill.) BSP (Pinaceae)) forests as well as in highbush blueberry (*Vaccinium corymbosum* L.) and lowbush blueberry (*Vaccinium angustifolium* Ait. (Ericaceae)) fields. Adults (n = 155) were collected between

22 April and 29 September but most frequently between the fourth week of June and the fourth week of July (Figure 4).

Figure 1. Habitus photograph of *Byrrhus americanus* LeConte. **Photo credit:** James Hammond, Northern Forestry Centre.



Figure 2. Distribution of *Byrrhus americanus*, *Byrrhus cyclophorus*, *Byrrhus geminatus*, *Chaetophora spinosa*, and *Curimopsis moosilauke* in Atlantic Canada.

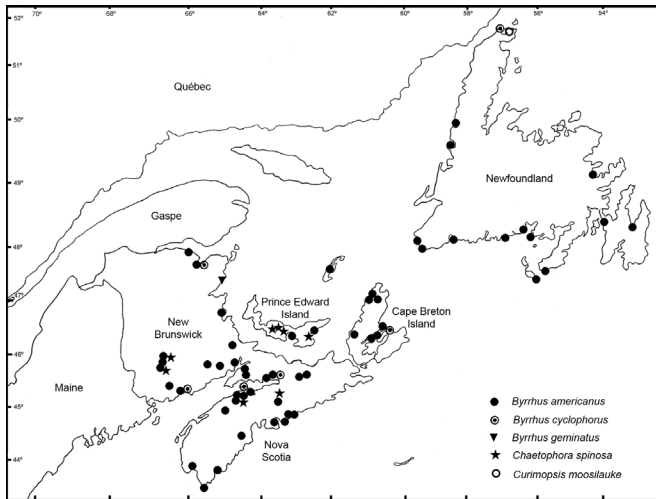
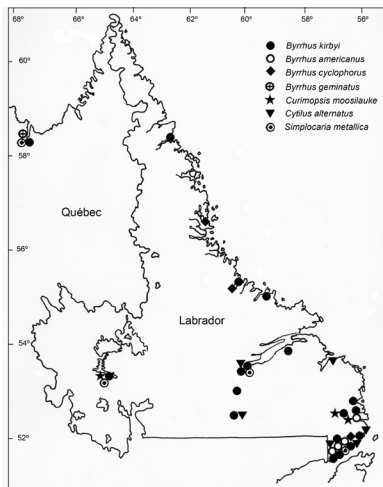


Figure 3. Distribution of *Byrrhus kirbyi*, *Byrrhus americanus*, *Byrrhus cyclophorus*, *Byrrhus geminatus*, *Curimopsis moosilauke*, *Simplocaria metallica*, and *Cytilus alternatus* in the Labrador region.



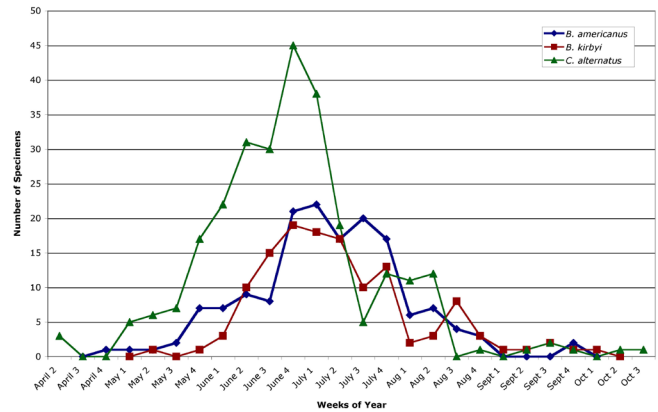
Byrrhus cyclophorus Kirby, 1837

NEWFOUNDLAND: Cooks Harbour, 21 July 1949, C.H. Lindroth (1, MZHF). **NEW BRUNSWICK: Gloucester County:** Bathurst, 9 July 1939, W.J. Brown (1, CNC); **Saint John County:** Saint John, 13 June 1903, W. McIntosh (1, NBM). **NOVA SCOTIA: Cape Breton County:** Sydney, 21 June 1965, W.J. Brown (1, CNC); **Colchester County:** Debert, 13 June 2003, K. George (1, NSNR); **Kings County:** Blomidon, 23 June 1950, C.D. Dondale (1, ACNS).

Byrrhus cyclophorus (Figure 5) is newly recorded in insular Newfoundland, New Brunswick, and Nova

Figure 4. Seasonal distribution of records of adult *Byrrhus americanus*, *Byrrhus kirbyi*, and *Cytilus alternatus* in Atlantic Canada.

Notes: The vertical axis represents the number of specimens; the horizontal axis indicates successive weeks of the year, from the second week of April to the third week of October.



Scotia (Figure 2). It was recorded from Labrador by Sherman (1910) and Casey (1912) (Figure 3).

Figure 5. Habitus photograph of *Byrrhus cyclophorus* Kirby. **Photo credit:** James Hammond, Northern Forestry Centre.



Byrrhus geminatus LeConte, 1854

LABRADOR: Churchill Falls, 16-21 June 1996, R.J. Penney, field, pan trap (2, CBU); Churchill Falls, 5-11 July 1996, R.J. Penney, woods, pan trap (1, CBU). **NEW BRUNSWICK: Northumberland County:** Tabusintac, 11 June 1939, 20 June 1939, W.J. Brown (2, CNC).

Byrrhus geminatus (Figure 6) is newly recorded in

Labrador and New Brunswick, and consequently in all of Atlantic Canada (Figure 2). It was recorded from Kuujjuaq, Québec (formerly Fort Chimo) on Ungava Bay by Sherman (1910). In Europe this Holarctic species is known from Italy, Switzerland, and central Russia (Sanchez-Terron 2010). In Alberta, Phillips et al. (2008) found this species to be abundant in burned mixed forests dominated by white spruce (*Picea glauca* (Moench) Voss (Pinaceae)), with abundant black spruce (*Picea mariana*), balsam poplar (*Populus balsamifera* L.), and trembling aspen (*Populus tremuloides* Michx. (Salicaceae)).

Figure 6. Habitus photograph of *Byrrhus geminatus* LeConte. **Photo credit:** James Hammond, Northern Forestry Centre.



Byrrhus kirbyi LeConte, 1854

ATLANTIC CANADA: 142 specimens were examined; 10 from New Brunswick, 131 from Newfoundland and Labrador, and one from Nova Scotia. **FRANCE:** Saint-Pierre et Miquelon: Saint-Pierre, 7-12 August 1951, C.H. Lindroth (2, MZHF).

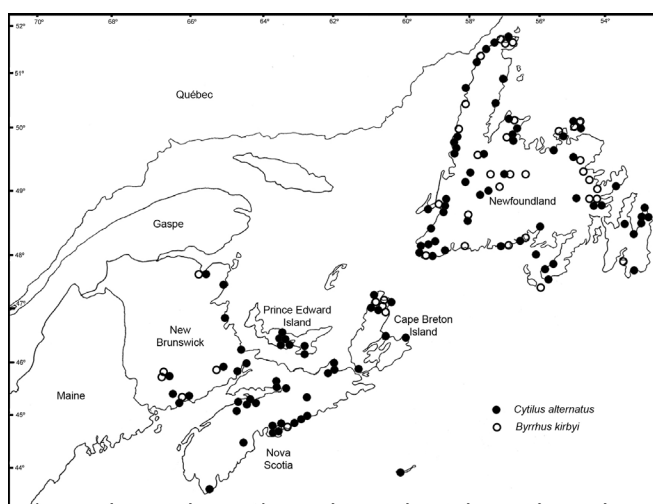
Byrrhus kirbyi (Figure 7) is newly recorded in the French territory of Saint-Pierre et Miquelon. It was recorded from Labrador by Sherman (1910), from insular Newfoundland by Leng (1920), and from New Brunswick and Nova Scotia by Johnson (1991b) (Figures 8 & 3). In Atlantic Canada, specimens were collected in black spruce (*Picea mariana*), mixed spruce-balsam fir (*Picea* sp.-*Abies balsamea* (L.) Mill (Pinaceae)), and birch (*Betula* sp.) stands as well as in forests described as mixed, boreal, and recently burned. In Labrador, they have been collected

in areas of dryas (*Dryas integrifolia* Vahl (Rosaceae)), crowberry (*Empetrum nigrum* L. (Empetraceae)) and cow parsnip (*Heracleum lanatum* Michx. (Apiaceae)). Adults (n = 129) were collected between 12 May and 8 October, with the highest frequency between the second week of June and the fourth week of July (Figure 4).

Figure 7. Habitus photograph of *Byrrhus kirbyi* LeConte. **Photo credit:** James Hammond, Northern Forestry Centre.



Figure 8. Distribution of *Byrrhus kirbyi* and *Cytillus alternatus* in Atlantic Canada.



Cytillus alternatus (Say, 1825)

ATLANTIC CANADA: 286 specimens were examined; 24 from New Brunswick, 197 from Newfoundland and Labrador, 54 from Nova Scotia, and 11 from Prince Edward Island.

Cytillus alternatus (Figure 9) was recorded from Labrador by Casey (1912), from insular Newfoundland by Leng (1920), from Nova Scotia by Howden (1970), from New Brunswick by Johnson (1991b), and from Prince Edward Island by Majka et al. (2006) (Figures 8 & 3). In Atlantic Canada, they have been found in coastal dunes; on sandy beaches; along river shores; beside temporary ponds; in red spruce (*Picea rubens* Sarg. (Pinaceae)) and black spruce forests; occasionally in mixed or deciduous forests and in barley (*Hordeum vulgare* L. (Poaceae)); and, alfalfa (*Medicago sativa* L. (Fabaceae)) fields. LeSage (1983) found larvae in a peat bog with a thick layer of sphagnum moss. Examination of gut contents showed that larvae were detritivores feeding on dead leaves, dead wood of Ericaceae (heaths), mosses, liverworts, and other vegetable matter. Levesque and Levesque (1994) collected adults in a raspberry plantation in Québec. In Atlantic Canada, adults (n = 270) were collected between 11 April and 17 October with the highest frequency between the fourth week of May and the second week of July (Figure 4).

Figure 9. Habitus photograph of *Cytillus alternatus* (Say). **Photo credit:** James Hammond, Northern Forestry Centre.



Porcinolus undatus (Melsheimer, 1844)

NEW BRUNSWICK: Northumberland County: Tabusintac, 20 June 1939, W.J. Brown (1, CNC); York County: New Maryland, 18 May 2003, R.P. Webster, mixed forest, pitfall trap (1, RWC). **NOVA SCOTIA:** Colchester County: Kempton, 26 May 2009, C. Cutler, blueberry field, pitfall trap (1, CGMC).

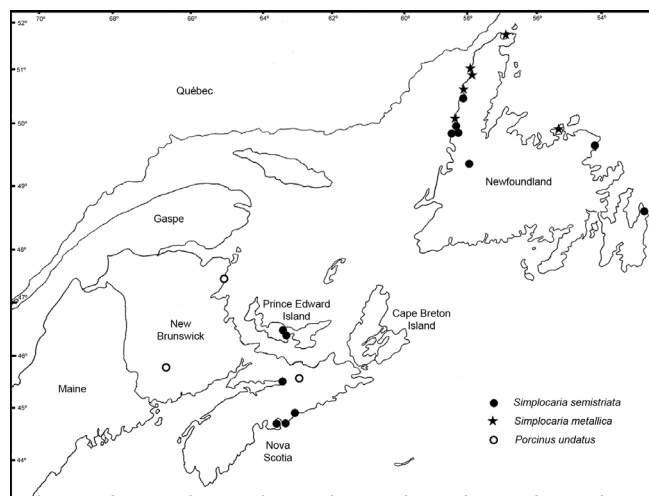
Porcinolus undatus (Figure 10) is newly recorded in New Brunswick and Nova Scotia, and in Atlantic

Canada (Figure 11). In this region one specimen was found in a mixed forest and another in a blueberry (*Vaccinium angustifolium*) field. Little information on the bionomics of this species is available.

Figure 10. Habitus photograph of *Porcinolus undatus* (Melsheimer). **Photo credit:** James Hammond, Northern Forestry Centre.



Figure 11. Distribution of *Simplocaria semistriata* and *Simplocaria metallica* and *Porcinus undatus* in Atlantic Canada.



Simplocariini

Simplocaria metallica (Sturm, 1807)

LABRADOR: Goose Bay, 2 August 1948, W.E. Beckel (1, CNC); Goose Bay, 21 July, 1992, K. Pierrault, pan trap (1, CNC); West St. Modest, 18-20 July 1951, C.H. Lindroth

(1, MZHF); Osak Camp, 27 September - 8 October 2004, S. Pardy, recently burned forest, pitfall trap (1, MUN).

Simplocaria metallica (Figure 12) was reported from Labrador (West St. Modest) by Sherman (1910), however, this record has been missed by subsequent compilations (Johnson 1991, 2004). The above records extend the known distribution of the species in Labrador (Figure 3). This Holarctic species is also known in Atlantic Canada from insular Newfoundland (Johnson 1991b) (Figure 11). In Europe, *Simplocaria metallica* is found in Fennoscandia, Svalbard, and northern Russia, south through Latvia, Poland, Slovakia, and Austria to France (Sanchez-Terron 2010) in the lower part of the alpine zone, among mosses in sandy places, often near watercourses and lakes. It also occurs in the sub-alpine region, and rarely in coniferous forests (Böcher 1988). In Greenland, it is found in association with the mosses *Polytrichum commune* Hedw. (Polytrichaceae), *Aulacomnium* sp., *Peltigera* sp., as well as on *Cerastium alpinum* L. (Caryophyllaceae) (Böcher 1988). In the United States, Johnson found it in mosses (*Bryum* sp.?) growing on sandy gravel soil in niches in boulder fields; larvae burrow in moss mats (Böcher 1988). In Atlantic Canada, adults (n = 26) were collected between 2 July and 7 August (one specimen at the end of September) but the data are insufficient to determine when peak activity occurs (Figure 13).

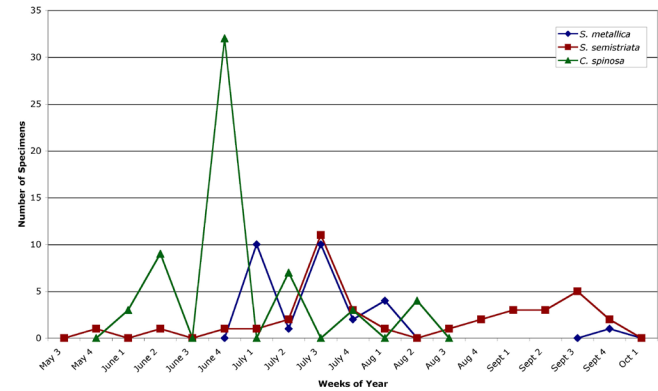
Figure 12. Habitus photograph of *Simplocaria metallica* (Sturm).
Photo credit: James Hammond, Northern Forestry Centre.



Simplocaria semistriata (Fabricius, 1794)

ATLANTIC CANADA: 69 specimens were examined; 54 from insular Newfoundland; 12 from

Figure 13. Seasonal distribution of records of adult *Simplocaria metallica*, *Simplocaria semistriata*, and *Chaetophora spinosa* in Atlantic Canada. **NOTE:** The vertical axis represents the number of specimens; the horizontal axis indicates successive weeks of the year, from the third week of May to the first week of October.



Nova Scotia, and 3 from Prince Edward Island.

The adventive Palearctic *Simplocaria semistriata* (Figure 14) was first recorded in North America from Nova Scotia in 1913 (Johnson 1990), from insular Newfoundland in 1949 (Lindroth 1957), and from Prince Edward Island in 2004 (Majka et al. (2006) (Figure 11). Lindroth (1957) refers to the “third” species of *Simplocaria* (i.e., neither *Simplocaria tessellata* nor *Simplocaria metallica*) found on Newfoundland, a certain reference to *Simplocaria semistriata*, a species that he and E. Palmén collected there in 1949. It is now widely distributed in northeastern North America with additional records in Minnesota and British Columbia (Johnson 1990). In Europe, it is found along the entire Atlantic coast from Spain to Fennoscandia and northern Russia (including Great Britain), the Baltic coast, Austria, the Czech Republic, Slovakia, and in Italy and Greece (Sanchez-Terron 2010). In Atlantic Canada, specimens have been collected in open heath, red spruce (*Picea rubens*) forests, and in barley fields. In North America, *Simplocaria semistriata* is known to graze on the pioneer moss *Dicranella heteromalla* (Hedw.) Schimp. (Dicranaceae), while in Scotland it has been found on *Mnium hornum* Hedw. (Mniaceae) (Johnson 1990). Levesque and Levesque (1994) collected substantial numbers in a raspberry plantation in Québec. In Atlantic Canada, adults (n = 37) were collected between 26 May and 23 September, and most frequently in the third week of July (Figure 13). In Québec, Levesque and Levesque (1994) found peak numbers in flight traps in September and in pitfall traps in October, and a small number of over-wintering adults in May.

Figure 14. Habitus photograph of *Simplocaria semistriata* (Fabricius).
Photo credit: James Hammond, Northern Forestry Centre.



Syncalyptrinae

Chaetophora spinosa (Rossi, 1794)

ATLANTIC CANADA: 67 specimens were examined; two from New Brunswick, three from Nova Scotia, and 62 from Prince Edward Island.

Chaetophora spinosa (Figure 15) was first recorded in Atlantic Canada by Majka et al. (2006) from specimens collected in Prince Edward Island in 2003–2005. Subsequently Majka et al. (2007) reported additional specimens of this adventive Palearctic species from both New Brunswick (2005–07) and Nova Scotia (1961–2006) (Figure 2). In Europe, the distribution of this species is scattered, from France, Italy, Sardinia, Corsica, Slovenia, and Serbia in the south, through Belgium, Great Britain, Poland, Czech Republic, Slovakia to Fennoscandia (except Norway), Belarus, and Russia in the north (Sanchez-Terron 2010). In Prince Edward Island, specimens were found on bare mud and associated with the moss *Mnium hornum*. In the USA, Johnson (1990) found adults associated with the mosses *Pohlia atropurpurea* (Wahl.) H. Lind (Bryaceae), *Dicranella varia* (Hedw.) Schimp. (Dicranaceae), and *Aloina brevirostris* (Hook. & Grev.) Kind. (Pottiaceae), although only the first two mosses and the alga, *Nostoc* sp., were confirmed as hosts. Levesque and Levesque (1994) collected substantial numbers in a raspberry plantation in Québec. In Atlantic Canada, adults (n = 58) were collected between 2 June and 15 August, with

the highest frequency apparently in the fourth week of June (Figure 13). In Québec, Levesque and Levesque (1994) found adults active from early May to mid September with two peaks of activity in mid May and mid June.

Figure 15. Habitus photograph of *Chaetophora spinosa* (Rossi).
Photo credit: James Hammond, Northern Forestry Centre.



Curimopsis moosilauke Johnson, 1986

LABRADOR: Osak Camp, 28 June - 11 July 2004, S. Pardy, recently burned forest, pitfall trap (1, MUN); Port Hope Simpson, 22 July - 5 August 2004, S. Pardy, black spruce forest, pitfall trap (1, MUN). **NEWFOUNDLAND:** Burnt Cape, 10-24 July 2003, A.M. Hynes, *Dryas* rock garden, pitfall trap (2, MUN); Burnt Cape, 21 August - 4 September 2003, A.M. Hynes, *Dryas* rock garden, pitfall trap (2, MUN); Burnt Cape, 10-24 July 2003, A.M. Hynes, cow parsnip patch, pitfall trap (1, MUN).

Curimopsis moosilauke (Figure 16) is newly recorded in insular Newfoundland. It was reported in Labrador from a single specimen collected in Battle Harbour by Johnson (1986), hitherto the only record of this species in Atlantic Canada (Figures 2 & 3). This suggests that the species is widespread in that jurisdiction. The above records from Labrador represent additional new localities for the species. Johnson (1986) found it to be characteristic above the krummholz ecotone in areas of fine, moist, matted mosses on sandy soils, often between rocks and boulders. In Newfoundland and Labrador, adults were collected in a black spruce forest, a dryas (*Dryas integrifolia*) heath, and a cow parsnip patch. In Atlantic Canada, adults (n =

8) were collected between late June and early September.

Figure 16. Habitus photograph of *Curimopsis moosilauke* Johnson.
Photo credit: James Hammond, Northern Forestry Centre.



DISCUSSION

To summarize: *Byrrhus americanus* and *Cytilus alternatus* are abundant and widely distributed throughout Atlantic Canada. *Byrrhus kirbyi* is abundant and very widely distributed in insular Newfoundland and southern Labrador. There are fewer records from New Brunswick and Nova Scotia, particularly in the latter province where most of those specimens have been collected from northern Cape Breton. *Byrrhus cyclophorus* has been recorded from Nain in northern Labrador, in northwestern Newfoundland, and in scattered locations in New Brunswick and Nova Scotia. *Byrrhus geminatus*, a Holarctic species of northern boreal forests, has been recorded from only a single site in northern New Brunswick and a single site in central Labrador. It has also been recorded from Kuujuaq on Ungava Bay in Québec, 225 km. east of northern Labrador.

There are only a small number of records of *Porcinolus undatus* from New Brunswick and Nova Scotia, however, available information is insufficient to conclude whether the species is genuinely rare in the region or occupies a habitat that has been insufficiently sampled. Two byrrhids evidently have northern boreal and/or low arctic distributions; *Simplocaria metallica* has been found in northern Newfoundland and southern Labrador, but not further south in the Atlantic region; and *Curimopsis moosilauke* is recorded only in the northwestern tip of Newfoundland and southern Labrador. The Burnt Cape Ecological Reserve at the tip of the Great Northern

Peninsula of Newfoundland, where both species have been found, with its low-arctic conditions and many relict arctic plants (Anonymous 2000), appears floristically and faunistically more akin to Labrador than it does to more southern parts of insular Newfoundland.

Two of the nine byrrhid species in the region are adventive. *Chaetophora spinosa* has now been found in a number of sites in the Maritime Provinces and appears to be particularly abundant on Prince Edward Island. *Simplocaria semistriata* is found throughout insular Newfoundland and also in a few sites in central Nova Scotia and Prince Edward Island. Further investigations are needed to determine the extent the distribution of these two species in the region.

In general, species diversity of Coleoptera declines with increasing latitude. Majka and Sikes (2009) quantified this relationship for eastern North American Coleoptera as $Y = -13.97 \cdot X + 834.23$ [where X = degrees of latitude, and Y = number of species/ $\ln(\text{area})$]. This is certainly true of Atlantic Canada. Although the numbers are now out of date, Bousquet (1991) reported 373 species of Coleoptera from Labrador (mean latitude 53.17° N) and 872 from insular Newfoundland (mean latitude 47.61° N), compared with the 1320 species recorded in Nova Scotia (mean latitude 44.65° N). With respect to this general trend, the Byrrhidae appear to be somewhat exceptional with six species found in Labrador, seven in insular Newfoundland, and seven in Nova Scotia. This may be related to the diversity of bryophytes, the host plants of Byrrhidae. In contrast to most groups of plants whose species diversity increases with decreasing latitude, mosses show little or no such latitudinal gradation, their species diversity remaining high at high latitudes (Shaw et al. 2005). Species diversity of vascular plants (the hosts of large Coleoptera families such as the Cerambycidae, Chrysomelidae, and Curculionidae) decreases along latitudinal gradients (Kreft and Jetz 2007).

The regional data concerning collection dates for adult byrrhids show that species, for which there is sufficient data, are generally more frequent in late June to early July. These data are, however, drawn from a number of different studies with different sampling methodologies conducted over different annual time frames. Therefore, it is difficult to conclude with certainty whether observed trends in frequency of adult collections truly represent relative abundance. Studies incorporating uniform sampling throughout the activity period are required to clearly discern true adult phenology/activity.

Available data on the distribution and seasonal distribution of Byrrhidae in Atlantic Canada must be interpreted with the caveat that collection effort for

this group remains heterogeneous in the region. The intensive and extensive collection activity of Carl H. Lindroth and Ernst Palmen in 1949 and 1952 in insular Newfoundland and southern Labrador has defined the fauna of those areas very well. A substantial number of studies conducted throughout Nova Scotia have also contributed to a relatively good understanding of the byrrhid fauna of this province. Other parts of the region, particularly northwestern New Brunswick and northern areas of Labrador, have been subject to significantly less investigation in terms of their byrrhid faunas.

Curimopsis echinata (LeConte) and *Arctobyrrhus subcanus* (LeConte) have been recorded in Québec (Laplante et al. 1991); the latter has also been found in Maine (Procter 1946; Chandler 2001). These jurisdictions neighbour Atlantic Canada, and consequently these species could potentially occur in the region. Clearly additional studies are required to better define the fauna of Atlantic Canada and the bionomics of species in the region.

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