



The Bean Weevils (Coleoptera: Chrysomelidae: Bruchinae) of Atlantic Canada

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ABSTRACT

The Bruchinae fauna of Atlantic Canada is surveyed. Three species, *Bruchidius villosus* (Fabricius), *Callosobruchus chinensis* (Linnaeus), and *Callosobruchus maculatus* (Fabricius), are newly recorded in Atlantic Canada. *Acanthoscelides obtectus* (Say) is newly recorded from insular Newfoundland, and *Megacerus discoideus* (Say) is newly recorded from Prince Edward Island for a total of seven new provincial records. The distributions of all six species in the region are mapped, and keys to identification of species are provided, as are colour habitus photographs. The bionomics of species is discussed, and dates of first detection of adventive species are provided. This is an unusual family of beetles in Atlantic Canada in that five of the six species are adventive, *Megacerus discoideus* being the only native bruchine found in the region. Four of the adventive species, *Callosobruchus chinensis*, *Callosobruchus maculatus*, *Bruchus pisorum* (Linnaeus), and *Acanthoscelides obtectus* are pests of dried stored pulses, although the latter two can survive in the wild in Canada, and are occasional (sometimes serious) pests of garden and crop plants in the Fabaceae.

RÉSUMÉ

Les bruches (Bruchinae) du Canada Atlantique sont recensées. Trois espèces, *Bruchidius villosus* (Fabricius), *Callosobruchus chinensis* (Linnaeus) et *Callosobruchus maculatus* (Fabricius), sont nouvellement signalées au Canada Atlantique. *Acanthoscelides obtectus* (Say) est nouvellement signalé sur l'île de Terre-Neuve et *Megacerus discoideus* (Say) est nouvellement signalé à l'île-du-Prince-Édouard, pour un total de sept additions aux faunes provinciales. La distribution de chacune des six espèces est cartographiée et des clés d'identification des espèces sont fournies, de même que des photographies couleurs de l'habitus. La bionomie des espèces est discutée et les dates de première détection des espèces adventives sont fournies. Cette sous-famille est inhabituelle au Canada Atlantique en ce sens que cinq des six espèces sont adventives, *Megacerus discoideus* étant la seule bruche indigène de la région. Quatre des espèces adventives, *Callosobruchus chinensis*, *Callosobruchus maculatus*, *Bruchus pisorum* (Linnaeus) et *Acanthoscelides obtectus*, sont des ravageurs des légumes secs entreposés, bien que les deux dernières puissent survivre dans la nature au Canada et qu'elles soient des ravageurs occasionnels (parfois importants) des Fabaceae en jardin et en culture.

Received 28 April 2011. Accepted for publication 2 June 2011. Published on the Acadian Entomological Society website at www.acadianes.ca/journal.html on 23 September 2011.

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INTRODUCTION

The bean weevils (Chrysomelidae: Bruchinae) are a relatively diverse group of beetles found throughout the world except for New Zealand and the Antarctic region. Approximately 1,350 species are known worldwide, 149 of which have been recorded in North America (Kingsolver 2002). McNamara (1991) recorded 19 species in Canada, although only two species, *Bruchus pisorum* (Linnaeus) and *Megacerus discoideus* (Say), were recorded in Atlantic Canada (New Brunswick, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island). The bionomics of species varies considerably; however, all are dependant upon seeds of various plants for their larval development. Amongst North American species, 80% are confined to plants in the Fabaceae; the other 20% feed on plants in the Convolvulaceae, Palmaceae, and Malvaceae (Kingsolver 2002). Until recently the bean weevils were regarded as a separate family, the Bruchidae (Kingsolver 2002). Recent investigators (i.e., Riley et al. 2003) have increasingly treated them as a subfamily of the Chrysomelidae. The present study surveys the Bruchinae fauna of Atlantic Canada based on specimens in museum collections and published literature.

METHODS AND CONVENTIONS

Specimens of Bruchinae originating from Atlantic Canada were examined and identified. Abbreviations of collections (largely following Evenhuis 2011) referred to below are:

ACNL	Agriculture and Agri-Food Canada, St. John's, NF & Lab, Canada
ACNS	Agriculture and Agri-Food Canada, Kentville, NS, Canada
ACPE	Agriculture and Agri-Food Canada, Charlottetown, PEI, Canada
CGMC	Christopher G. Majka Collection, Halifax, NS, Canada
CNC	Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, ON, Canada
MUN	Memorial University of Newfoundland Collection, St. John's, NF & Lab, Canada (currently on long term loan to the Canadian Forest Service, Edmonton, AB)
NSAC	Nova Scotia Agricultural College, Bible Hill, NS, Canada
NSMC	Nova Scotia Museum, Halifax, NS, Canada
RWC	Reginald Webster Collection, Charters Settlement, NB, Canada
STFX	Saint Francis Xavier University, Antigonish, NS, Canada
UMNB	Université de Moncton, Moncton, NB, Canada

IDENTIFICATION

A key to species of Bruchinae found in Atlantic Canada (adapted from Kingsolver 2002, 2004) is provided on page 77.

RESULTS

As a result of an examination of 232 specimens of Bruchinae from Atlantic Canada, seven new provincial records are reported, including four species newly recorded in the region (Table 1).

Brucidini

Bruchidius villosus (Fabricius, 1792)

NOVA SCOTIA: Shelburne County: Lake George, 22 June 2003, G.D. Selig, on *Cytisus scoparius* (4, NSMC); Shelburne, 29 June 2003, G.D. Selig, on *Cytisus scoparius* (3, NSMC).

Bruchidius villosus (Fabricius) (Figure 1) is newly recorded in Atlantic Canada from the above records in southwestern Nova Scotia (Figure 1). Hosts for this adventive Palaearctic species include a number of plants in the Fabaceae, only one of which, the adventive weed scotch broom (*Cytisus scoparius* (L.) Link), is found in Atlantic Canada where it is restricted to southwestern Nova Scotia (Roland 1998). Adults feed in the flowers of scotch broom (Kingsolver 2004).

Figure 2. Dorsal habitus photograph of *Bruchidius villosus* (Fabricius). **Photo credit:** Udo Schmidt, Kafer der Welt, Selbitz, Germany.



Callosobruchus chinensis (Linnaeus, 1758)

NOVA SCOTIA: Antigonish County: Antigonish, late March 2008, R.F. Lauff, in residence (1, STFX); **Halifax County:** Halifax, 8 March 1982, B. Wright (10, NSMC).

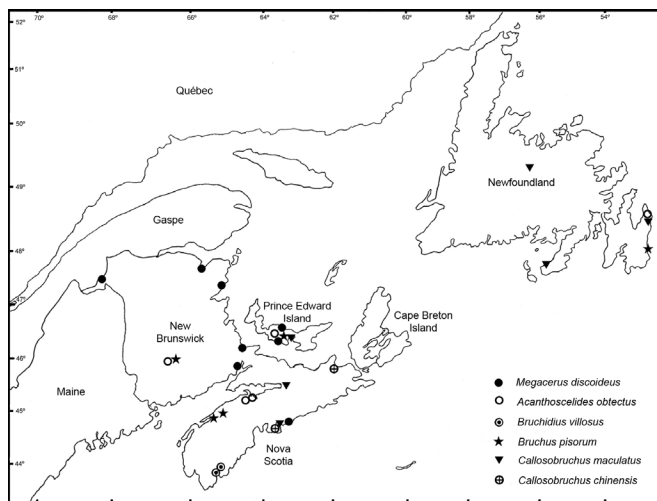
Table 1. Bruchinae fauna of Atlantic Canada.

	NB	NS	PE	NF	Distribution in NE North America
Bruchinae					
Brucidini					
<i>Bruchidius villosus</i> (Fabricius) †		1			MA, NY, NS, ON
<i>Callosobruchus chinensis</i> (Linnaeus) †		1			NH, NS, NY
<i>Callosobruchus maculatus</i> (Fabricius) †		1	1	1	NF, NH, NS, ON, PE
Bruchini					
<i>Bruchus pisorum</i> (Linnaeus) †	1	1	1	1	CT, MA, NB, NF, NH, NS, NY, ON, QC, PE
Megacerini					
<i>Megacerus discoideus</i> (Say)	1	1	1		NB, NH, NS, NY, ON, PE, QC
Acanthoscelidini					
<i>Acanthoscelides obtectus</i> (Say) †	1	1	1	1	CT, MA, ME, NB, NF, NH, NS, NY, ON, PE, QC, RI
Total	3	6	4	3	

Notes: NB = New Brunswick; NS = Nova Scotia; PE = Prince Edward Island; NF = insular Newfoundland. †, adventive species.

Distribution in northeastern North America: ON = Ontario; QC =, Québec; LB = Labrador; PM = Saint-Pierre et Miquelon; CT = Connecticut; MA = Massachusetts; ME = Maine; NH = New Hampshire; NY = New York; RI = Rhode Island; and VT = Vermont.

Figure 2. Distribution of *Megacerus discoideus*, *Acanthoscelides obtectus*, *Bruchidius villosus*, *Bruchus pisorum*, *Callosobruchus maculatus*, and *Callosobruchus chinensis* in Atlantic Canada.



Callosobruchus chinensis (Linnaeus) (Fig. 3) is newly recorded in Atlantic Canada from the above records in Nova Scotia (Fig. 1). Commonly referred to as the cow-pea weevil or mung-bean bruchid, this species is cosmopolitan, possibly originating in China. The hosts plants are seeds of various species in the Fabaceae, including pigeon pea (*Cajanus cajan* (L.) Mill.), chickpea (*Cicer arietinum* L.), guar bean (*Cyamopsis tetragonoloba* (L.) Taub.), soybean

Figure 3. Dorsal habitus photograph of *Callosobruchus chinensis* (Linnaeus). **Photo credit:** Simon Hinkley, Museum Victoria, Melbourne, Australia.



(*Glycine max* (L.) Merr.), hyacinth bean (*Lablab purpureus* (L.) Sweet), blue sweet pea (*Lathyrus sativus* L.), lentil (*Lens culinaris* Medikus), lima bean (*Phaseolus lunatus* L.), common bean (*Phaseolus vulgaris* L.), pea (*Pisum sativum* L.), winged bean (*Psophocarpus tetragonolobus* (L.) D.C.), broad bean (*Vicia faba* L.), moth bean (*Vigna aconitifolia* (Jacq.) Marechal), black bean (*Vigna mungo* (L.) Hepper), mung bean (*Vigna radiata* (L.) R. Wilczek), and crowder pea (*Vigna unguiculata* (L.) Walp.)

(Kingsolver 2004). *Callosobruchus chinensis* is found naturally in areas with tropical climates; however, it is sometimes imported to other areas as a stored-product pest in association with the importation of legumes. It does not survive in the wild in Canada (Campbell et al. 1989).

Callosobruchus maculatus (Fabricius, 1775)

NEWFOUNDLAND AND LABRADOR: St. John's, 6 December 1968, R.F. Morris (17, ACNL); St. John's, 6 December 1991, no collector recorded (1, MUN); Grand Falls, 14 September 1983, R.F. Morris (1, ACNL); Grand Bank, 8 February 1984, R.F. Morris (4, ACNL). **NOVA SCOTIA: Colchester County:** Truro, 1973, M.E. Neary, reared from mung beans (64, NSAC); **Halifax County:** Dartmouth, 4 September 2002, D. Cowan, in kitchen (2, CGMC); Dartmouth, 24 August 1993, P.C.O. (4, NSMC); Halifax, 20 September 1979, B. Wright (2, NSMC); Halifax, 21 October 1991, D. MacKenzie (18, NSMC). **PRINCE EDWARD ISLAND: Queens County:** Charlottetown, August 1972, L.S. Thompson (4, ACPE).

Callosobruchus maculatus, the cowpea weevil (Figure 4), is newly recorded in Atlantic Canada from the above records in insular Newfoundland, Nova Scotia, and Prince Edward Island (Figure 2). It is a cosmopolitan species, possibly originating in Africa. Due to the similarity of this species with *Callosobruchus chinensis*, many non-professionals do not distinguish between them; hence the common name is applied to both. The hosts are seeds of various plants in the Fabaceae including pigeon pea, chickpea, soybean, hyacinth bean, yellow pea (*Lathyrus aphaca* L.), Spanish vetchling (*Lathyrus clymenum* L.), blue sweet pea, lentil, tepary bean (*Phaseolus acutifolius* A. Gray), lima bean, common bean, pea, broad bean, yellow vetch (*Vicia lutea* L.), common vetch (*Vicia sativa* L.), black bean, mung bean, and crowder pea (Fabaceae) (Kingsolver 2004). It is found naturally in areas with warmer climates, and it is sometimes imported to other areas as a stored product pest in association with the importation of legumes. It does not survive in the wild in Canada (Campbell et al. 1989).

Bruchini

Bruchus pisorum (Linnaeus, 1758)

NOVA SCOTIA: Annapolis County: Annapolis Royal, no date provided, H.G. Payne (1, NSAC); Bridgetown, 22 May 1915, G.E. Sanders, on pea (1, NSAC; 3, ACNS).

Bruchus pisorum (Figure 5) was recorded from New Brunswick, Nova Scotia, Prince Edward Island, and

Figure 4. Dorsal habitus photograph of *Callosobruchus maculatus* (Fabricius). **Photo credit:** Natasha Wright, Florida Department of Agriculture and Consumer Services, Bugwood.org.



Figure 5. Dorsal habitus photograph of *Bruchus pisorum* (Linnaeus). **Photo credit:** Natasha Wright, Florida Department of Agriculture and Consumer Services, Bugwood.org.



Newfoundland and Labrador in Campbell et al. (1989) (Fig. 1). MacNay (1956) found it infesting peas in small gardens in Fredericton, New Brunswick. Bain and Prévost (2007) found it in archeological excavations in Ferryland in Newfoundland and Labrador in deposits from latrines dating between 1621 and 1673. The "pea weevil" is one of the most widely distributed beetles in the world

(Kingsolver 2004). Adults and larvae feed on the seeds of blue sweet pea, pea, and field pea (*Pisum elatius* Bieb.) (Fabaceae) (Kingsolver 2004). Although an adventive species, it survives in the wild in Canada, and it has been recorded across the country from British Columbia east to insular Newfoundland as a sporadic (and occasionally serious) pest of garden peas (Campbell et al. 1989).

Megacerini

Megacerus discoideus (Say, 1824)

NEW BRUNSWICK: Albert County: Mary's Point, 6 July 2004, V. Webster & R. Webster, salt marsh on *Calystegia* (1, RWC); Mary's Point, 15 August 2011, C.G. Majka, on *Calystegia sepium* (3, CGMC); **Gloucester County:** Bathurst, 10 July 1939, W.J. Brown (3, CNC); **Madawaska County:** St. Jacques, 22 August 1980, G. Grondin (1, UMN); **Northumberland County:** Tabusintac, 26 June 1939, 19 July 1939, 20 July 1939, W.J. Brown (5, CNC); **Westmorland County:** Shediac, 30 June 1939, 4 July 1939, W.J. Brown, (2, CNC). **NOVA SCOTIA: Halifax County:** Lawrencetown, 19-20 July 1967, H.F. Howden (1, CNC). **PRINCE EDWARD ISLAND: Queens County:** Cavendish, 14 July 2002, C.G. Majka, coastal lagoon on *Calystegia sepium* (1, CGMC); Victoria, 13-20 July 1994, M.E.M. Smith, potato field, pitfall trap (1, ACPE).

Megacerus discoideus (Figure 6) is newly recorded from Prince Edward Island. It was reported from New Brunswick and Nova Scotia by McNamara (1991) (Figure 2). The larvae of this native North American species is associated with bindweed (*Convolvulus arvensis* L.), wild morning glory (*Calystegia sepium* (L.) R. Br.), and morning glory (*Ipomoea* sp.) (all Convolvulaceae). Adults are found on flowers of many plant species (Kingsolver 2004).

Acanthoscelidini

Acanthoscelides obtectus (Say, 1831)

NEWFOUNDLAND & LABRADOR: St. John's, 17 November 1982, R.F. Morris, in dry white beans in penitentiary (6, ACNL). **NOVA SCOTIA: Kings County:** Greenwich, 15 September 1946, 18 September 1946, M.E. Neary (13, NSAC); Kentville, 14 July 1943, 18 September 1946, M.E. Neary (5 NSAC); Kentville, 8 June 1949, P.N. Grainger (1, NSAC); Kentville, 15 August 1948, 25 August 1948, R.E. Morehouse (17, NSAC); Kentville, 16 June 1947, V.R. Vickery (25, NSAC).

Acanthoscelides obtectus (Figure 7) is newly recorded from insular Newfoundland. It was first recorded in

Figure 6. Dorsal habitus photograph of *Megacerus discoideus* (Say). **Photo credit:** Kurt Schaefer, Texhoma, Oklahoma, USA.



Figure 7. Dorsal habitus photograph of *Acanthoscelides obtectus* (Say). **Photo credit:** Miroslav Deml, Morávka, Czech Republic.



Nova Scotia in 1937 (MacNay 1950); in New Brunswick by Beirne (1971); and from Prince Edward Island by Campbell et al. (1989) (Figure 2). In Canada it is chiefly a pest of dried stored beans; however, Beirne (1971) reported infestations in agricultural fields in New Brunswick, Québec, Ontario, Saskatchewan, and British Columbia.

Acanthoscelides obtectus is a cosmopolitan species that probably originated in Central America or northern South America (Kingsolver 2004). Its primary hosts are species of beans in the genus *Phaseolus* including

the tepary bean, runner bean (*Phaseolus coccineus* L.), lima bean, common bean, and Santa Rita Mountain bean (*Phaseolus ritensis* M.E. Jones), although other beans such as pigeon pea, chickpea, soybean, hyacinth bean, blue sweet pea, lentil, pea, Egyptian pea (*Sesbania sesban* (L.) Merr.), broad bean, moth bean, mung bean, bambara bean (*Vigna subterranean* (L.) Verdc.), rice bean (*Vigna umbellata* (Thunb.) Ohwi & H. Ohashi), and crowder pea are also utilized (Kingsolver 2004).

DISCUSSION

As a result of the above investigations, three species of Bruchinae, *Bruchidius villosus*, *Callosobruchus chinensis*, and *Callosobruchus maculatus*, are newly recorded in Atlantic Canada. Additionally, although *Acanthoscelides obtectus* was reported from the Maritime Provinces by several authors, this information was not integrated into the provincial checklists prepared by McNamara (1991). *Acanthoscelides obtectus* is newly recorded from insular Newfoundland and *Megacerus discoideus* is newly recorded from Prince Edward Island, for a total of seven new provincial records.

The bruchine fauna of Atlantic Canada is unusual in that it consists primarily of adventive species. Five of the six species found in the region are introduced. Of these, *Callosobruchus chinensis*, *Callosobruchus maculatus*, *Bruchus pisorum*, and *Acanthoscelides obtectus* are stored product pests feeding on various species of peas and beans, although the latter two can survive in the wild in Canada and are occasional pests of garden and crop plants in the Fabaceae. Although there are historical reports of *Bruchus pisorum* and *Acanthoscelides obtectus* causing significant damage to crops in Canada and in the Maritime Provinces, these species are currently considered only minor pests (Beirne 1971; Campbell et al. 1989). *Bruchidius villosus*, an adventive Palaearctic bruchine, is associated with scotch broom and is restricted to southwestern Nova Scotia where this introduced plant is found. Dates of first detection of all these adventive species in Atlantic Canada and in North America are provided in Table 2. Some species, such as *Bruchus pisorum*, have been present in North America since at least 1621 (Bain and Prévost 2007). There is only one native species of bruchine found in Atlantic Canada, *Megacerus discoideus*, which is frequently found in coastal sites associated with its host plant, *Calystegia sepium*.

ACKNOWLEDGEMENTS

We extend our sincere thanks to Carolyn Parsons (Agriculture and Agri-Food Canada, St. John's), Susan

Westby (formerly with Agriculture and Agri-Food Canada, Kentville), Christine Noronha and Mary Smith (Agriculture and Agri-Food Canada, Charlottetown), Erhardt Dobsberger (Canadian Food Inspection Agency, Ottawa), Karine Savard (Canadian National Collection of Insects, Arachnids, and Nematodes), Jean Pierre Le Blanc (formerly at the Nova Scotia Agricultural College), Randy Lauff (St. Francis Xavier University), Gaétan Moreau and Pauline Duerr (Université de Moncton), and Reginald P. Webster for making specimens, records, and information available. Sincere thanks to Miroslav Deml, Simon Hinkley, Kurt Schaefer, Udo Schmidt, and Natasha Wright for generously contributing habitus photographs of the species. Many thanks to Shawn M. Clark (Brigham Young University) for his many constructive comments to an earlier version of the manuscript. The first author thanks David Christianson, Calum Ewing, and Andrew Hebda at the Nova Scotia Museum for continuing support and encouragement, and M. Rudy Haase for his generous support. This work has been supported by the Board of Governors of the Nova Scotia Museum.

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Table 2. Atlantic Canada Bruchinae: dates of earliest detection of adventive species.

	NB	NS	PE	NF	NA
<i>Bruchidius villosus</i> (Fabricius)		2003			1918
<i>Callosobruchus chinensis</i> (Linnaeus)		1982			<1920
<i>Callosobruchus maculatus</i> (Fabricius)		1973	1972	1968	1873
<i>Bruchus pisorum</i> (Linnaeus)	1956	1915	<1989	1621	1621
<i>Acanthoscelides obtectus</i> (Say)	<1971	1937	<1989	1982	1831

Notes: NB = New Brunswick; NS = Nova Scotia; PE = Prince Edward Island; NF = insular Newfoundland; NA = North America
< = prior to.

Key to species of Bruchinae found in Atlantic Canada (adapted from Kingsolver 2002, 2004).

- 1. Lateral pronotal margin with a single large tooth projecting laterally*Bruchus pisorum* (Linnaeus)
- Lateral pronotal margin without a single large tooth projecting laterally 2

- 2(1). Ventrolateral margin of metafemur with an angulation or tooth 3
- Ventrolateral margin of metafemur without an angulation or tooth..... 4

- 3(2). Elytral striae three and four each with prominent subbasal denticle on slight gibbosity.
..... *Callosobruchus chinensis* (Linnaeus)
- Elytral striae lacking prominent denticle or gibbosity..... *Callosobruchus maculatus* (Fabricius)

- 4(2). Tenth elytral stria ending opposite metacoxa; metafemur not enlarged
..... *Megacerus discoideus* (Say)
- Tenth elytral stria extending to apical margin of elytron; metafemur usually moderately or
strongly enlarged..... 5

- 5(4). Metafemur with single, sometimes minute, denticle on ventromesal margin
..... *Bruchidius villosus* (Fabricius)
- Metafemur with multiple denticles on ventromesal margin*Acanthoscelides obtectus* (Say)