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# The Biodiversity of Beetles in the Maritime Provinces

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Understanding invertebrate biodiversity is a tall order, something apparent to anyone who has attempted to bite off even a minute slice of this very large pie. As many investigators have pointed out there is a “taxonomic deficit” in the biological community today as universities and training institutions gravitate towards molecular and genetic studies, and government funding for taxonomic, systematic, and biodiversity studies remains very meager. Yet being able to identify organisms and determine the species composition of environments is not only an important activity per se, but is also pivotal to the understanding of ecology, endangered species, climate change, introduced and invasive species, and the environmental impacts of anthropogenic activities. If we don’t accurately know the composition of biological communities, how can we conserve them or ascertain if they are changing or being affected by human activities?

Knowledge of the biodiversity of terrestrial invertebrates has lagged behind that of vertebrates or even vascular plants. There are many species, some require detailed microscopic examination (even of genitalia) to identify them, the taxonomy of many groups is poorly understood, there are long and difficult learning curves to acquire technical proficiency in identification, taxonomic expertise is in short supply, and much of the primary literature is scattered in scientific journals published around the world over the past couple of centuries in a potpourri of languages. Such obstacles have proved daunting to many who have contemplated aspects of this undertaking.

Beetles (Coleoptera) are thought to be the most species-rich order of organisms in the world. Estimates vary of how many there may be, however, Terry Erwin, a coleopterist working with the Smithsonian Institution has estimated that as many 20 million species exist worldwide (Erwin 1991), perhaps a quarter of the ~ 80 million species of insects. Only some 350,000 species of beetles have been described, of which ~ 25,160 have been recorded in North America (Marske and Ivie 2003).

A major step in understanding the beetle fauna of Canada was the publication in 1991 of the *Checklist of Beetles of Canada and Alaska* (Bousquet 1991). This enumerated 7,447 species in Canada including 1,365 from New Brunswick, 1,320 from Nova Scotia, and 340



*Euvira micmac* Klimaszewski and Majka, 2007  
(photograph by Klaus Bolte)

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from Prince Edward Island. This compendium was an important synthesis of information (some published and some not), however, from the standpoint of the Maritime Provinces, the coverage it was able to provide was meager. The authors of the various chapters relied, for the most part, on the holdings of the Canadian National Collection of Insects, Arachnids, and Nematodes (CNC) in Ottawa (as well as published sources). Although there are many collections of insects in the Maritimes, some dating to the latter part of the nineteenth century, most have remained little known. The quality of determinations (if the specimens were identified at all) varied greatly, and even when names had been attached to specimens, they often reflected dated nomenclature and taxonomy. Consequently the holdings of most of these collections were not at a level where they could usefully contribute to an understanding of the region's beetle fauna.

In 2000 I became interested in understanding the beetle fauna of the Maritime Provinces. As an ecologist I am interested in ecological perspectives on the natural world, and in order to take a step in this direction, and not be reliant on scarce taxonomic expertise of "experts," I embarked on the slow path of understanding Coleopteran taxonomy. Only in this way would it be possible discern the biodiversity of beetles in the region, itself a necessary prerequisite to ecological, environmental, evolutionary, and other studies of the fauna. In so doing I discovered both that there were extensive collections of Coleoptera at organizations such as Agriculture Canada (Kentville, NS; Charlottetown, PEI; Fredericton, NB); the Nova Scotia Department of Natural Resources (Shubenacadie, NS); the Canadian Forest Service (CFS) (Fredericton, NB; Corner Brook, NF); many universities (Cape Breton (CBU), Acadia, Dalhousie, St. Mary's, University of Prince Edward Island, Memorial University, and the Université de Moncton); at institutes such as the Nova Scotia Agricultural College (NSAC); the New Brunswick and Nova Scotia provincial museums; and in the hands of private collectors.

Furthermore there were a number of researchers in the region interested in Coleoptera. David McCorquodale (CBU); Søren Bondrup-Nielsen (Acadia); Peter Duinker and Tatiana Rossolimo (Dalhousie); Doug Strongman (St. Mary's); Donna Giberson (UPEI); David Larson (Memorial); Gaetan Moreau (Moncton); Jean-Pierre Le Blanc (NSAC); Jeff Ogden (NS DNR); Christine Noronha, Mary Smith, Susan Westby, and Gilles Boiteau (Agriculture Canada); Patricia Baines and Jon Sweeney (CFS); and collectors such as Ken Neil, Dwayne Sabine, Gary Selig, David Webster, Reggie Webster, and others, who proved enthusiastic supporters of initiatives that would better define the beetle fauna of the region. Students such as Kathleen Aikens, DeLancey Bishop, Chantelle Cormier, Philana Dollin, Clayton D'Orsay, Rebecca Ewing, Daniel Kehler, Sean LeMoine, Heather Love, Andrew MacDonald, and Sheena Townsend deserve special credit for a series of excellent studies that have contributed much contemporary knowledge about the beetle communities of the Maritimes. Moreover, this enthusiasm was not just confined to the region. Many Coleoptera researchers at the Canadian National Collection (Pat Bouchard, Yves Bousquet, Anthony Davies, Serge Laplante, Laurent Lesage, and Ales Smetana) and the Canadian Forest Service (Jan Klimaszewski, David Larson), and the countless taxonomic experts around the country, continent, and world assisted the initiative through their determinations of species and expertise. Consequently I've been able to assemble a team of investigators on the ground who have collected material and supplied specimens, and a "virtual" team that have supported these initiatives. What has been the result?

Since 2004, together with various "team" members, I have published 54 scientific papers in peer-reviewed publications pertaining to the beetles of Atlantic Canada. Nine additional papers are in press, five are being reviewed, and eight others have been completed and will shortly be submitted for publication, a total of 76 studies. Some have been surveys of aspects

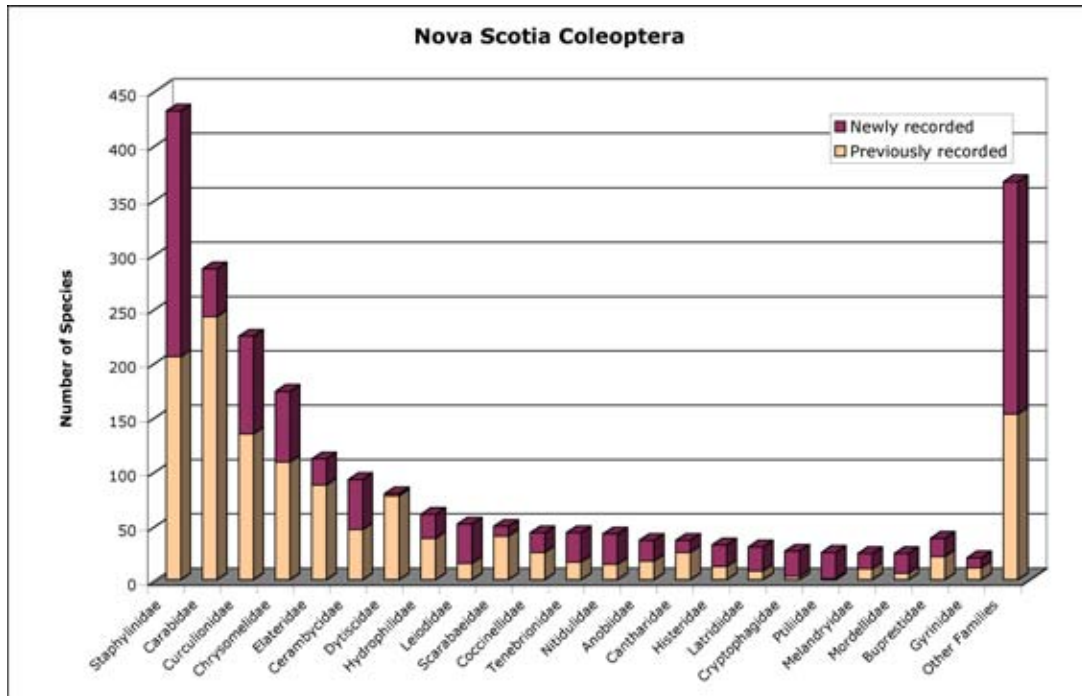


Fig.1. The beetle fauna of Nova Scotia; composition and newly recorded species.

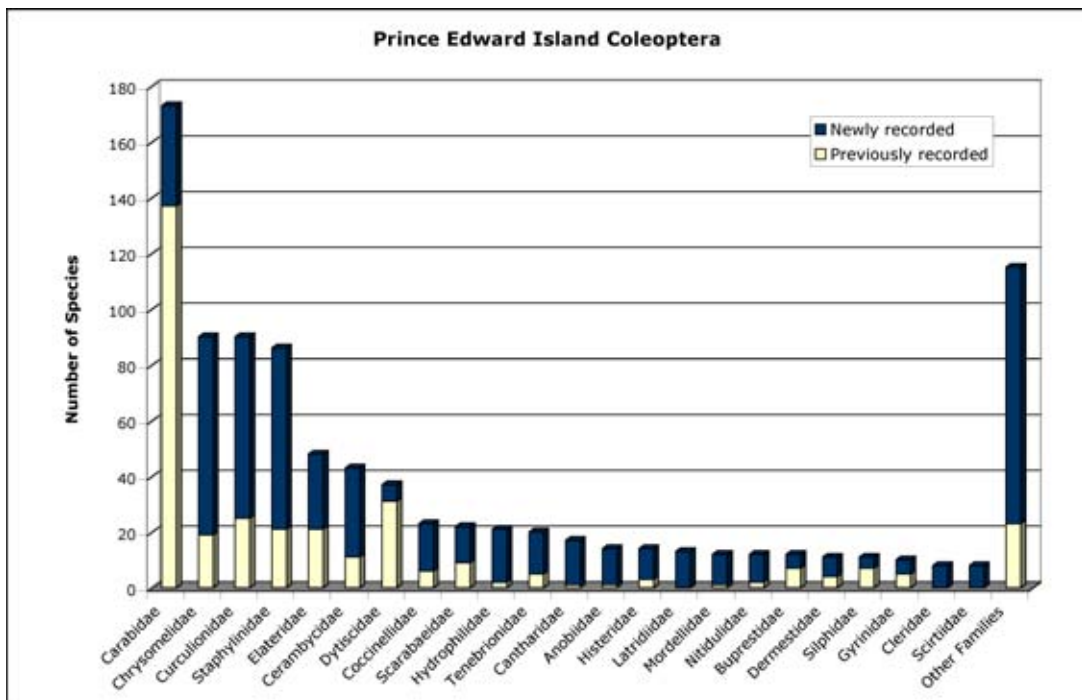


Fig. 2. The beetle fauna of Prince Edward Island; composition and newly recorded species.

of the fauna, contributing new provincial, national, and continental records; others have been ecological studies, reviews of the biology of particular species, systematic reviews and descriptions of new species, studies of island faunas, studies of saproxylic species associated with decaying wood, reviews of particular habitats such as coastal faunas, and theoretical and methods papers.

Through a careful examination of historical specimens in regional collections, and availing ourselves of the results of contemporary studies, these studies have substantially increased the known beetle fauna of the region. Using as a point of departure the data presented in Bousquet (1991), the beetle fauna of Nova Scotia has increased from 1,320 to 2,352 (+ 1,032) species (Fig. 1). The known beetle fauna of Prince Edward Island has increased from 340 to 895 (+ 555) species (Fig. 2). Comparable statistics in relation to New Brunswick are currently being compiled which will further allow us to examine the complete regional fauna of the Maritime Provinces. Even a quick glance at these graphs yields certain insights. The most speciose family in NS is the Staphylinidae, whereas on PEI it is the Carabidae. The Leiodidae, Cryptophagidae, Ptiliidae, and Melandryidae are important com-

ponents of the NS fauna, but are much less represented on PEI. Are these differences reflective of different environmental circumstances between the two provinces, or are they simply indicative of differential collection efforts? Only further research can resolve such questions. The graphs also reveal past emphases on families such as the Carabidae and Dytiscidae, which have historically received more attention (consequently fewer new species have been discovered), and (for example) the Ptiliidae, Cryptophagidae, and Latridiidae in Nova Scotia, and the Hydrophilidae, Cantharidae, Anobiidae, Latridiidae, Mordellidae, Nitidulidae, Cleridae, and Scirtidae (amongst others) on PEI about which almost nothing was previously known. Within these overall patterns is a large number of interesting topic areas:

- **Introduced Species** such as *Ptinus sexpunctatus* (Anobiidae); *Dinoderus minutus* (Bostrichidae); *Sphaeroderma testaceum* (Chrysomelidae); *Orchidophilus aterrimus*, *Ceutorhynchus pallidactylus* (Curculionidae); *Dermestes undulatus* (Dermestidae); *Cephennium gallicum* (Scydmaenidae); *Atheta celata*, *Phloeocharis subtilissima*, and *Quedius fuliginosus* (Staphylinidae) have all been newly recorded in North America from collections made in the Maritime Provinces.



Christopher Majka sweeping for beetles in a salt marsh at Mary's Point, New Brunswick.  
(Photograph by Yves Poussart)



• **Native Species** such as *Ernobius filicornis*, *Ernobius granulatus*, *Utohium marmoratum* (Anobiidae); *Hyperaspis brunnescens*, *Naemia s. seriata* (Coccinellidae); *Clypastrea lunata*, *Clypastrea fuscum*, *Rypobius marinus*, *Gloeosoma hesperus* (Corylophidae); *Listronotus dietzi*, *Corthylus columbianus* (Curculionidae); *Mordellistena indistincta*, *Mordellistena rubrifascia*, *Mordellistena rubrilabris* (Mordellidae); *Acrotichis haldemani*, *Acrotichis josephi*, *Pteryx* sp. (Ptiliidae); *Atheta irrita*, *Meotica exilis*, and *Myrmecopora vaga* (Staphylinidae) have all been newly recorded in Canada and/or eastern North America from specimens collected in the region.

• **Newly described species** such as *Bembidion iridipenne* Bousquet and Webster (Carabidae); *Hadromychnus chandleri* Bousquet and Leschen (Endomychidae); *Gnathoncus barbatus* Bousquet and Laplante (Histeridae); *Atheta brunswickensis* Klimaszewski, *Atheta acadensis* Klimaszewski and Majka, *Atheta pseudocrenuliventris* Klimaszewski, *Atheta savardae* Klimaszewski and Majka, *Euvira micmac* Klimaszewski and Majka, *Leptusa jucunda* Klimaszewski and Majka, *Leptusa pseudopaca* Klimaszewski and Majka, *Proteinus acadensis* Klimaszewski, and *Proteinus pseudothomasi* Klimaszewski (Staphylinidae) have recently been described, in whole or in part based on specimens collected in the Maritime Provinces.

• The biology, dispersal, and early timelines of **introduced leaf beetles** such as *Chrysolina staphylaea*, *Crioceris asparagi*, *Crioceris duodecimpunctata*, *Cassida flaveola*, *Cassida rubiginosa*, *Lilioceris lili*, *Oulema melanopus*, *Sphaeroderma testaceum*, and *Pyrrhalta viburni* has been examined in detail.

• The **Coleoptera families** Anthribidae, Apionidae, Attelabidae, Boridae, Bostrichidae, Byrrhidae, Carabidae, Cerambycidae, Ciidae, Cleridae, Coccinellidae, Colydiidae, Corylophidae, Curculionidae, Dermestidae, Derodontidae, Elateridae, Endomychidae, Erotylidae, Eucnemidae, Histeridae, Kateridae, Latriidae, Leiodidae, Melandryidae,



*Rypobius marinus* LeConte  
(photograph by Christopher Majka)

Melyridae, Mordellidae, Mycertidae, Nemonychidae, Nitidulidae, Ptiliidae, Pyrochroidae, Pythidae, Ripiphoridae, Salpingidae, Scaptiidae, Synchronidae, Tenebrionidae, and Tetratomidae in the Maritime Provinces have all been surveyed in recent publications (some of these studies are still in press or in review). This includes 39 of the 93 families found in the region and represents 50% of the beetle fauna of the Maritime Provinces. A few specific highlights:

- *Hyperaspis brunnescens*, one of the rarest lady beetles in North America, previously known from Illinois, Iowa, and Minnesota, was discovered in a Leach's Petrel burrow on Scatarie Island, NS, a range extension of some 2,100 km (Majka et al. 2007). How widely distributed is this species? Does it represent a relict population? Is it regularly found in subterranean habitats?
- *Quedius s. speleaus* is a cave-dwelling rove beetle found from BC to Saskatchewan in Canada and north to NY in the USA. An apparently disjunct population is found in caves in Nova Scotia (Moseley et al. 2006) together with *Gennadota canadensis*, another cavernicolous rove beetle previously known from only Pennsylvania and Québec (Majka et al. 2006b).
- Majka et al. (2006a) investigated the beetle faunas of owl nests in Nova Scotia finding the first North American records of the Palearctic rove beetle *Atheta celata*,

as well as *Atheta irrita*, a rove beetle previously known only from its type locale in southwestern Nevada. Finding *A. celata* in remote Boreal Owl nest in Cape Breton (in addition to six other introduced species) is an interesting indicator of how adventive species have colonized native habitats. Is *A. irrita* a regularly occurring co-inhabitant of owl nests (whose fauna has seldom been studied in North America)?

- Majka and McCorquodale (2006) newly recorded two species of lady beetles in Canada, *Diomus amabilis* and *Naemia s. seriata*, from collections made in Nova Scotia. Both are coastal species found in the USA north to New England. *Naemia seriata* inhabits salt marshes feeding on *Spartina* pollen. Both likely represent disjunct populations in Nova Scotia and work on the genetics of *N. seriata* is presently being carried out by Natalia Vandenberg at the Smithsonian Institution.

- Klimaszewski and Majka (2007) described a new species of rove beetle, *Euvira micmac*, which is an inquiline in oak apple galls known from Nova Scotia, Ohio, and Michigan.
- *Hadromychnus chandleri* is probably the rarest species of endomychid (handsome fungus beetle) in North America. It was described by Bousquet and Leschen (2002) on the basis of seven specimens from New Hampshire, Nova Scotia, Ontario, and Québec. Majka (2007a) reported five additional specimens from Nova Scotia, the apparent population “centre” of this species.

An ongoing important area of interest and investigation are saproxylic beetles (those associated with the decomposition of wood), and several major studies on this topic are presently in press or in review. A number of the survey papers published to date have dealt with saproxylic families and Fig. 3 illustrates one

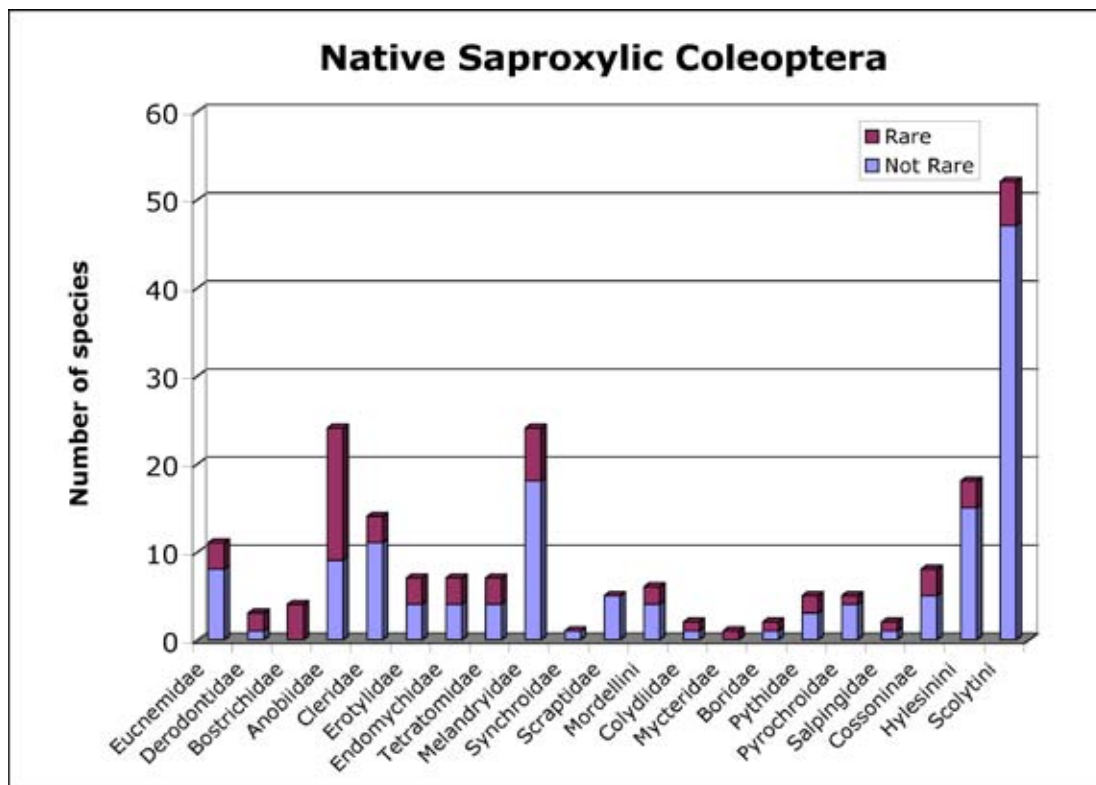


Fig. 3. Native saproxylic beetles of the Maritime Provinces. Rare species are those represented by  $\leq 5$  specimens of  $\leq 0.005\%$  of specimens examined.



*Hyperaspis brunnescens* (Dobzhansky)  
(photograph by Christopher Majka)

important result of these studies. Several papers summarized in Majka (2007b) have found sizeable fractions of the fauna that are apparently rare, i.e., those represented by  $\leq 5$  specimens (or  $\leq 0.005\%$  of specimens examined). Fifty-nine of 208 species (28%) investigated thus far fall into this category, a result which may at least in part be attributable to the long history of forest management practices in the region.

Although we have learned a very considerable amount about the beetle fauna of the region, it is nonetheless clear that much remains to be done. It is to be hoped that a basic understanding of the biodiversity of the region, and a sense of the origins and distribution of its fauna, will serve as springboards for further ecological, physiological, genetic, environmental, and other studies.

#### References cited

- Bousquet, Y. (ed.). 1991. *Checklist of Beetles of Canada and Alaska*. Agriculture Canada: Research Branch, Publication 1861/E, Ottawa. 430 pp.
- Bousquet, Y. and R.A.B. Leschen. 2002. Description of a new genus and species of Endomychidae (Coleoptera: Cucujoidea) from Northeastern North America. *The Coleopterists Bulletin* 56(2): 291–298.
- Erwin, T.L. 1991. How many species are there?: Revisited. *Conservation Biology* 5(3): 330–333.
- Klimaszewski, J., and C.G. Majka. 2007. *Euvira micmac*, a new species (Coleoptera, Staphylinidae, Aleocharinae), and first record of the genus in Canada. *The Canadian Entomologist* 139(2): 147–153.
- Majka, C.G. 2007a. The Erotylidae and Endomychidae (Coleoptera: Cucujoidea) of the Maritime Provinces of Canada: new records, zoogeography, and observations on beetle-fungi relationships and forest health. *Zootaxa* 1546: 39–50.
- Majka, C.G. 2007b. The Eucnemidae (Coleoptera) of the Maritime Provinces of Canada: new records, observations on composition and zoogeography, and comments on the scarcity of saproxylic beetles. *Zootaxa* 1636: 33–46.
- Majka, C.G. and D.B. McCorquodale. 2006. The Coccinellidae (Coleoptera) of the Maritime Provinces of Canada: new records, biogeographic notes, and conservation concerns. *Zootaxa* 1154: 49–68.
- Majka, C.G., J. Klimaszewski, and R.F. Lauff. 2006a. New Coleoptera records from owl nests in Nova Scotia, Canada. *Zootaxa* 1194: 33–47.
- Majka, C.G., M. Moseley, and J. Klimaszewski. 2006b. *Gennadota canadensis* (Casey) (Staphylinidae: Aleocharinae): new records, a range extension, and bionomic notes. *The Coleopterists Bulletin* 60(3): 231–234.
- Majka, C.G., K.R. Aikens, A. MacDonald, S.M. Townsend, D.B. and McCorquodale. 2007. *Hyperaspis brunnescens* Dobzhansky (Coleoptera: Coccinellidae) newly recorded in Canada from Scatarie Island, Nova Scotia. *Entomological News* 118(4): 402–406.
- Marske, K.A. and M.A. Ivie. 2003. Beetle fauna of the United States and Canada. *The Coleopterists Bulletin* 57: 495–503.
- Moseley, M., J. Klimaszewski, and C. G. Majka. 2006. Description of the pupa and observations on the distribution, ecology and life history of *Quedius spelaeus spelaeus* Horn (Coleoptera: Staphylinidae) in Nova Scotia, Canada. *Zootaxa* 1226: 61–68.