Chapter 23

Longhorn beetles (Coleoptera: Cerambycidae) of the Atlantic Maritime Ecozone

David B. McCorquodale

Abstract: About one-third of the cerambycid fauna of Canada, 133 of approximately 365 species, occurs in the Atlantic Maritime Ecozone. Seven of the eight subfamilies in Canada are represented. Six species are only recorded for Canada in the Atlantic Maritime Ecozone. Four are native species that also occur in the eastern United States, *Phymatodes ater* LeConte, *Acmaeops discoideus* (Haldeman), *Brachyleptura circumdata* (Olivier), and *Oberea myops* Haldeman, while two are introduced Palearctic species, *Tetropium fuscum* Fabricius and *Hylotrupes bajulus* (Linnaeus). Cerambycid larvae feed on plants, therefore, their distributions largely reflect the distributions of their host plants. Of the species found in the Atlantic Maritime Ecozone, more than half are distributed south of the boreal forest in eastern North America. Many of these feed on hardwoods. About 15% are found primarily in the boreal forest. A similar number are widespread in North America south of the boreal forest. Smaller numbers are widely distributed in North America, and five are Holarctic. Three species are native to the Palearctic and are adventive in North America. The cerambycid fauna of the Atlantic Maritime Ecozone is smaller than that of the neighbouring Mixedwood Plains Ecozone. With the exception of the six species noted above and a handful of boreal species, all cerambycids of the Atlantic Maritime Ecozone also occur in the Mixedwood Plains Ecozone.

Résumé : Environ un tiers des cérambycidés du Canada, soit 133 espèces sur environ 365, est présent dans l'écozone maritime de l'Atlantique. Sept des huit sous-familles du Canada sont représentées. Six espèces sont uniquement recensées au Canada dans l'écozone maritime de l'Atlantique. Quatre sont des espèces indigènes qui sont aussi présentes dans l'est des États-Unis, *Phymatodes ater* LeConte, *Acmaeops discoideus* (Haldeman), *Brachyleptura circumdata* (Olivier) et *Oberea myops* Haldeman, tandis que deux sont des espèces paléarctiques introduites, *Tetropium fuscum* Fabricius et *Hylotrupes bajulus* (Linnaeus). Les larves de cérambycidés se nourrissent de plantes, et leur répartition reflète par conséquent largement celle de leurs plantes hôtes. Parmi les espèces recensées dans l'écozone maritime de l'Atlantique, plus de la moitié se trouve au sud de la forêt boréale de l'Amérique du Nord orientale. Un grand nombre de ces espèces se nourrissent de feuillus. Environ 15 % se trouvent principalement dans la forêt boréale. Un nombre similaire d'espèces est largement répandu en Amérique du Nord au sud de la forêt boréale. Un plus petit nombre est largement réparti en Amérique du Nord, et cinq sont holarctiques. Trois espèces sont indigènes à la région paléarctique et sont adventices en Amérique du Nord. La faune de cérambycidés de l'écozone maritime de l'Atlantique est plus restreinte que celle de l'écozone voisine des plaines à forêts mixtes. À l'exception des six espèces mentionnées ci-dessus et d'une poignée d'espèces boréales, tous les cérambycidés de l'écozone maritime de l'Atlantique sont aussi présents dans l'écozone voisine des plaines à forêts mixtes.

Introduction

The Cerambycidae is a diverse family of beetles in the Chrysomeloidea (Turnbow and Thomas 2002), recognized within the superfamily by the relatively long antennae, insertion of antennae on protuberances between the eyes, and usually notched eyes (Linsley 1961; Yanega 1996). Worldwide there are approximately 20 000 described species. Of these, 958 are known from North America north of Mexico, making it the eighth largest family of beetles in North America (Turnbow and Thomas 2002; Marske and Ivie 2003). McNamara (1991) reported 354 species or subspecies in Canada. Since then, at least eight more species have been recorded in Canada (McCorquodale 2001; Smith and Hurley 2001). The taxonomy of North American species is well known through the monographs of Linsley (1961–1964), Linsley and Chemsak (1972,

D.B. McCorquodale. Department of Biology, Cape Breton University, Sydney, NS B1P 6L2, Canada.
E-mail: david_mccorquodale@cbu.ca

Correct citation: McCorquodale, D.B. 2010. Longhorn beetles (Coleoptera: Cerambycidae) of the Atlantic Maritime Ecozone. *In* Assessment of Species Diversity in the Atlantic Maritime Ecozone. *Edited by* D.F. McAlpine and I.M. Smith. NRC Research Press, Ottawa, Canada. Pages 465–476.

1976, 1985, 1995, 1997), and Chemsak (1996). Yanega (1996) provides readily accessible information on the identification of the cerambycids found in the Atlantic Maritime Ecozone (AME), a region covering the provinces of New Brunswick, Nova Scotia, and Prince Edward Island, and Îles de la Madeleine, part of the Eastern Townships, and the Gaspé region of Quebec.

Larvae feed internally on plants (Linsley 1961; Solomon 1995; Turnbow and Thomas 2002). Most feed on wood or bark of trees and shrubs, although a few are root feeders, and some species not found in the AME feed within stems of herbaceous plants (Linsley 1961). The host range varies. Species that feed on dead wood have the broadest host range, while those that feed on living plants have the narrowest host range (Bily and Mehl 1989). The breadth of host use in AME species varies from catholic, including numerous species of both coniferous and angiosperm trees and shrubs (e.g., *Lepturobosca chrysocoma* (Kirby), *Strangalepta abbreviata* (Germar), *Parandra brunnea* Fabricius), to generalists on hardwoods (e.g., *Anthophylax cyaneus* (Haldeman), *Pidonia ruficollis* (Say), *Xylotrechus colonus* (Fabricius), *Psenocerus supernotatus* (Say)) to generalists on conifers (e.g., *Acmaeops p. proteus* (Kirby), *Monochamus s. scutellatus* Haldeman, *Xylotrechus undulatus* (Say)) to specialists on one or a few related species (e.g., *Saperda tridentata* Olivier on *Ulmus* spp. (elm; Ulmaceae); *Desmocerus palliatus* (Forster) on *Sambucus* spp. (elder; Caprifoliaceae), *Megacyllene robiniae* (Forster) on *Robinia pseudoacaica* L. (black locust; Fabaceae)).

Distribution of each species is linked to its host plant range. In North America, forested areas have a diverse fauna, and forests with more tree and shrub species have a more diverse cerambycid fauna than areas with lower woody plant diversity.

Collections of Cerambycidae and sources of information

Information presented in this chapter is based on examination of specimens of Cerambycidae in insect collections in eastern Canada. The regional collections of the following were examined: Agriculture and Agri-Food Canada, Charlottetown (ACPE); University of Prince Edward Island, Charlottetown (UPEI); Agriculture and Agri-Food Canada, Kentville (ACNS); Acadia University, Wolfville; Nova Scotia Agricultural College, Truro (NSAC); Nova Scotia Museum of Natural History, Halifax (NSMC); Saint Francis Xavier University, Antigonish (STFX); Cape Breton University, Sydney (CBU); Atlantic Forestry Centre, Canadian Forest Service, Fredericton (FRLC); Université de Moncton, Moncton (UMNB); and New Brunswick Museum, Saint John (NBM). Also studied were collections from the following: Royal Ontario Museum, Toronto (ROM); University of Guelph, Guelph (DEBU); Lyman Entomological Museum, MacDonald Campus, McGill University, Montreal (LEM); Canadian Museum of Nature, Gatineau, Quebec (CMN); and Canadian National Collection of Insects, Arachnids and Nematodes at Agriculture and Agri-Food Canada, Ottawa (CNC). Effort was focussed on the Maritime Provinces more so than the Quebec portions of the AME. Most of the specimens examined from the Quebec portion of the AME were housed in the FRLC, Fredericton, and CNC, Ottawa. There is a superb network of private collections in Quebec, but these were not examined and are not included except for specimens reported by Laplante (1989). Compared to the wealth of specimens from pre-1930 from southern Ontario (McCorquodale 2001), there are few from the AME, and many of these are minimally labelled.

In addition to work in collections, information on occurrence in the AME, distribution across North America, and biology was gleaned from Linsley's monographs (1961 and on). Since the provinces of New Brunswick, Nova Scotia, and Prince Edward Island are entirely within the AME, the *Checklist of Beetles of Canada and Alaska* (McNamara 1991) was used as a starting point. Most species recorded in the three Maritime Provinces were also recorded from Quebec in McNamara (1991), but the ecozone(s) was (were) not specified. Therefore, the coverage of the Maritime Provinces is more complete than coverage of the Quebec portion of the AME. The hills around Lake Memphremagog and west to the boundary of the ecozone undoubtedly harbour several more species of Cerambycidae.

Most collections of Cerambycidae in the AME are by generalist insect collectors (e.g., J. McDunnough; J. Ogden, C. Majka; J. Cook; and R. Webster) or forest entomologists whose major focus was other forest insects (e.g., C.E. Atwood). There are two exceptions. J. Knull collected in the Bathurst area, probably in the 1920s and 1930s, resulting in a good picture of the fauna of this area, but unfortunately, his specimens are minimally labelled, that is, lacking a date. The second exception is a group of Quebec entomologists, especially S. Laplante (e.g., Laplante 1989), with considerable expertise in Cerambycidae biology and collecting. They have collected in the westernmost Quebec portion of the AME west of Lac Memphremagog.

Some large forestry research projects included a Cerambycidae component. For example, there are interesting specimens from Green River in northern New Brunswick and Cascapedia, Quebec, housed at the FRLC, Fredericton. Specimens submitted to the Forest Insect and Disease Survey (FIDS) over many years across the region, especially from southern New Brunswick, provide important distributional data.

Wood boring beetles were the focus of studies of tree health in Point Pleasant Park in Halifax (Robertson 1990) and are deposited in the Nova Scotia Museum of Natural History, Halifax. The first specimens of the introduced *Tetropium fuscum* (Fabricius) were collected during this project and were misidentified as the widespread native species, *T. cinnamopterum* Kirby. After they were correctly identified by S. Laplante, CNC, in 1999, a campaign to eradicate *T. fuscum* and surveys to determine its distribution in the AME were initiated (Smith and Hurley 2001; Canadian Forestry Service 2003). Some collec-

Table 1. Geographic distributions and the number of species by subfamily of Cerambycidae in the Atlantic Maritime Ecozone.

Category	Operational definition	Parandrinae, Prioninae, Spondylinae, Aseminae	Cerambycinae	Lepturinae	Lamiinae	Total
Holarctic	North America and Europe	2	2	2		6
Palearctic-I	Europe, introduced in North America	1	1		1	3
Widespread	Both east and west of 100°W and from the boreal forest to southern US	1	1	2	4	8
Widespread-S	Both east and west of 100°W and south of AME		1		7	8
Widespread-E	Both east and west of 100°W, bulk of records east of 100°W	1	1	3	2	7
Widespread-W	Both east and west of 100°W, bulk of records west of 100°W	1	3	1		5
Widespread-B	Both east and west of 100°W from AME north into the boreal forest	1	4	6	3	14
Eastern	East of 100°W, from the boreal forest to southern US	1		1		2
Eastern-S	East of 100°W, AME and south	2	21	31	23	77
Eastern-B	East of 100°W, AME and north into the boreal forest			3		3
Total		10	34	49	40	133

tions from these later surveys are becoming available and have the potential to enhance our understanding of the distribution and abundance of native species (Smith and Hurley 2005).

Cerambycids were collected during insect inventories of national parks, (Cape Breton Highlands, Kejimkujik, and Kouchibouguac), but are far from complete inventories of the parks (e.g., Lafontaine et al. 1987). They are largely species collected by generalist insect collectors.

Studies on forest beetles, specifically the influence of forest management on beetle distribution and abundance, provide valuable data on cerambycid distribution across Nova Scotia (Kehler et al. 2004). This work prompted a report on new records of Cerambycidae for Nova Scotia (McCorquodale and Bondrup-Nielsen 2004).

Nomenclature follows Yanega (1996) and Monne and Giesbert (1995). Where distinctive subspecies have been named (e.g., *Stictoleptura c. canadensis* (Olivier)), host plant and geographic range refer to the subspecies in the AME rather than the species as a whole. Recent work on Holarctic taxa has resulted in some changes in generic names. They include the following: in the Parandrinae, *Neandra brunnea* (Fabricius) instead of *Parandra brunnea* (Fabricius) (Santos-Silva 2002); in the Spondylidinae, *Neospondylis upiformis* (Mannerheim) instead of *Spondylis upiformis* Mannerheim (Sama 2005); in the Lepturinae, *Lepturobosca chrysocoma* (Kirby) instead of *Cosmosalia chrysocoma* (Kirby), *Anoplodera pubera* (Say) instead of *Strangalepta pubera* (Say) (Miroshnikov 1998); and in the Lamiinae, *Liopinus* Linsley and Chemsak now *Sternidius* LeConte, while *Sternidius variegatus* (Haldeman) is now *Astyleiopus variegatus* (Haldeman), and *Graphisurus fasciatus* (DeGeer) instead of *Urographis fasciatus* (DeGeer) (Bousquet 2007).

Each species was assigned to 1 of 10 categories of geographic distribution (defined in Table 1), similar to the categories used by Yanega (1996). Each species was assigned to one of five categories of larval food use: deciduous (e.g., maple, oak, poplar, birch), coniferous (e.g., hemlock, spruce, fir, pine, larch, juniper), both deciduous and coniferous, shrub (e.g., elderberry, raspberry), and unknown. Information was gleaned largely from Linsley and Chemsak (1995) and Yanega (1996), as few specimens from the AME included host plant data.

Overview of systematics and geographic distribution

One hundred and thirty-three species in seven subfamilies have been recorded in the AME. Only one other subfamily, Disteniinae, often given family status by cerambycid workers (Monne and Giesbert 1995), occurs in northeastern North America (Turnbow and Thomas 2002).

The occurrence of each species by province in the AME, overall geographic distribution, and host plants are summarized in Table 2. Occurrence by province is based on McNamara (1991), with updates from Smith and Hurley (2001, 2005), McCorquodale and Bondrup-Nielsen (2004), Majka et al. (2007), and Webster et al. (2009). From Quebec, 126 species are recorded; from New Brunswick, 116; from Prince Edward Island, 44; and from Nova Scotia, 99 (Table 3). Species included in McNamara (1991) for which supporting specimens were not found in collections are noted in Tables 2 and 3.

Parandrinae (1 species)

One species, *Neandra brunnea*, is widely distributed from southern Canada to the southern United States in eastern North America and has been found in southern Quebec. Larvae feed on a wide variety of coniferous and deciduous trees.

Table 2. The Cerambycidae recorded in the Atlantic Maritime Ecozone, with distribution by province (1, previously recorded and specimens seen; 1+, first report; 1*, recorded in McNamara (1991) and no specimens seen), overall distribution (see Table 1 for categories), and host plants (C, conifers; D, deciduous; S, shrubs).

	Distribution					
	PQ	NB	PE	NS	Overall	Host
Parandrinae						
Parandrini						
Neandra brunnea (Fabricius, 1798)	1	1+			Widespread-E	C, D
Prioninae						
Prionini						
Orthosoma brunneum (Forster, 1771)	1	1+		1	Eastern-S	C, D
Prionus laticollis (Drury, 1773)	1				Eastern-S	C, D
Meroscelisini						
Tragosoma desparium (Linnaeus, 1767)	1	1		1	Holarctic	C
Spondylinae						
Neospondylis upiformis (Mannerheim, 1843)	1*	1+			Widespread-W	C
Aseminae						
Asemini						
Arhopalus foveicollis (Haldeman, 1847)	1	1	1	1	Widespread	C
Asemum striatum (Linnaeus, 1758)	1	1	1+	1	Holarctic	C
Tetropium cinnamopterum Kirby, 1837	1	1+	1	1	Widespread-B	C
Tetropium schwarzianum Casey 1891	1*	1+		1	Eastern	C
Tetropium fuscum (Fabricius, 1787)				1	Palearctic-I	C
Cerambycinae						
Elaphidiini						
Anelaphus parallelus (Newman, 1840)	1*	1+		1	Eastern-S	D
Anelaphus villosus (Fabricius, 1792)	1*			1	Widespread-S	D
Enaphalodes rufulus (Haldeman, 1847)	1*			1	Eastern-S	D
Psyrassa unicolor (Randall, 1838)	1*	1+		1	Eastern-S	D
Obriini						
Obrium rufulum Gahan, 1908	1*	1+			Eastern-S	D
Molorchini						
Molorchus b. bimaculatus Say, 1824	1	1+		1	Eastern-S	D
Callidiini						
Callidium violaceum (Linnaeus, 1758)	1	1	1	1	Holarctic	C
Hylotrupes bajulus (Linnaeus, 1758)	1				Palearctic-I	C
Meriellum proteus (Kirby, 1837)	1				Widespread-W	C
Phymatodes ater LeConte, 1884				1*	Eastern-S	D
Phymatodes dimidiatus (Kirby, 1837)	1	1	1	1	Widespread-W	C
Phymatodes maculicollis LeConte, 1878	1*	1*			Widespread-W	C
Phymatodes testaceus (Linnaeus, 1758)	1*	1+		1	Holarctic	D
Pronocera collaris (Kirby, 1837)	1	1	1	1	Widespread-B	C
Ropalopus sanguinicollis (Horn, 1860)	1	1	1		Eastern-S	D
Semanotus l. ligneus (Fabricius, 1787)	1*	1+		1*	Eastern-S	C
Semanotus litigiosus (Casey, 1891)	1	1		1+	Widespread-B	C
Stenopterini						
Callimoxys s. sanguinicollis (Olivier, 1795)	1*	1+			Eastern-S	D
Clytini						
Calloides n. nobilis (Harris, 1837)	1*			1	Eastern-S	D
Clytus marginicollis Laporte and Gory, 1835	1	1		1	Eastern-S	C
Clytus ruricola (Olivier, 1795)	1	1	1	1	Eastern-S	D

Table 2 (*continued*).

	Distribution					
	PQ	NB	PE	NS	Overall	Host
Glycobius speciosus (Say, 1828)	1	1+	1	1	Eastern-S	D
Megacyllene robineae (Forster, 1771)	1*	1+	1	1	Eastern-S	D
Neoclytus acuminatus (Fabricius, 1775)	1*	1		1+	Eastern-S	D
Neoclytus l. leucozonus (Laporte and Gory, 1835)	1	1	1	1	Widespread-B	C
Xylotrechus annosus (Say, 1826)	1*	1		1	Widespread	D
Xylotrechus colonus (Fabricius, 1775)	1	1		1	Eastern-S	D
Xylotrechus integer (Haldeman, 1847)	1	1	1	1	Eastern-S	C
Xylotrechus quadrimaculatus (Haldeman, 1847)	1*	1		1	Eastern-S	D
Xylotrechus s. sagittatus (Germar, 1821)	1*			1	Widespread-E	C
Xylotrechus undulatus (Say, 1824)	1	1+	1	1	Widespread-B	C
Anaglyptini						
Cyrtophorus verrucosus (Olivier, 1795)	1	1+		1	Eastern-S	D
Microclytus compressicollis (Laporte and Gory, 1835)	1		1+		Eastern-S	Unknown
Trachyderini						
Purpuricenus humeralis (Fabricius, 1798)	1*	1+			Eastern-S	D
Lepturinae						
Desmocerini						
Desmocerus palliatus (Forster, 1771)	1	1		1	Eastern-S	D
Lepturini						
Acmaeops discoideus (Haldeman, 1847)				1+	Eastern-S	C
Acmaeops p. proteus (Kirby, 1837)	1	1	1	1	Widespread	C
Acmaeops pratensis (Laicharting, 1784)	1	1		1	Holarctic	C
Acmaeopsoides rufula (Haldeman, 1847)	1*	1+		1	Eastern-B	Unknown
Analeptura lineola (Say, 1824)	1	1	1	1	Eastern-S	D
Anastrangalia sanguinea (LeConte, 1859)	1	1		1	Widespread-B	C
Anoplodera pubera (Say, 1826)	1	1+			Eastern-S	D
Anthophylax attenuatus (Haldeman, 1847)	1	1	1+	1	Eastern-S	D
Anthophylax cyaneus (Haldeman, 1847)	1	1		1	Eastern-S	D
Anthophylax viridis LeConte, 1850	1	1+	1	1	Eastern-S	D
Bellamira scalaris (Say, 1827)	1*	1	1	1	Eastern-S	D
Brachyleptura champlaini Casey, 1913	1*	1+	1	1	Eastern-S	C
Brachyleptura circumdata (Olivier, 1795)		1+			Eastern-S	C
Brachyleptura rubrica (Say, 1824)	1*	1		1	Eastern-S	D
Brachysomida bivittata (Say, 1824)	1*	1		1	Widespread-E	Unknown
Centrodera decolorata (Harris, 1841)	1*	1		1	Eastern-S	D
Encyclops caerula (Say, 1826)	1*	1+			Eastern-S	D
Evodinus m. monticola (Randall, 1838)	1	1	1	1	Eastern-B	C
Gaurotes cyanipennis (Say, 1824)	1*	1+			Eastern-S	D
Grammoptera exigua (Newman, 1841)	1				Eastern-S	D
Grammoptera haematites (Newman, 1841)	1	1			Eastern-S	Shrub
Grammoptera subargentata (Kirby, 1837)	1	1	1	1+	Widespread-B	D
Idiopidonia pedalis (LeConte, 1861)	1	1		1	Eastern-S	Unknown
Judolia m. montivagans (Couper, 1864)	1	1		1	Widespread-B	C, D
Leptura plebeja Randall, 1838	1*	1		1	Eastern-S	C
Leptura obliterata deleta (LeConte, 1850)		1+			Widespread-W	Unknown
Leptura subhamata Randall, 1838	1*	1		1	Eastern-S	C
Lepturobosca chrysocoma (Kirby, 1837)	1	1	1	1	Widespread	C, D
Lepturopsis biforis (Newman, 1841)	1*	1		1	Eastern-S	C, D
Metacmaeops vittata (Swederus, 1787)	1				Eastern-S	C, D
Neoalosterna capitata (Newman, 1841)	1	1		1	Eastern-S	D
Pachyta lamed liturata Kirby, 1837	1				Widespread-B	C
Pidonia ruficollis (Say, 1824)	1	1	1	1	Eastern-S	D
Pygoleptura n. nigrella (Say, 1826)	1	1	1	1	Widespread-B	C
Rhagium inquisitor (Linnaeus, 1758)	1	1	1	1	Holarctic	C
Sachalinobia rugipennis (Newman, 1844)	1	1		1	Eastern-B	C
Stenocorus schaumii (LeConte, 1850)		1+			Eastern-S	D
Stenocorus vittiger (Randall, 1838)	1	1+			Eastern-S	D
Stictoleptura c. canadensis (Olivier, 1795)	1	1	1	1	Eastern	C

Table 2 (*concluded*).

	Distribution					
	PQ	NB	PE	NS	Overall	Host
Strangalepta abbreviata (Germar, 1824)	1*	1	1	1	Eastern-S	C, D
Strophiona nitens (Forster, 1771)	1*	1+	1	1	Widespread-E	D
Trachysida aspera brevifrons (Howden, 1959)	1	1	1+	1	Eastern-S	C
Trachysida mutabilis (Newman, 1841)	1	1	1	1	Widespread-E	D
Trigonarthris minnesotana (Casey, 1913)	1	1	1	1	Eastern-S	C, D
Trigonarthris proxima (Say, 1824)	1*	1+		1	Eastern-S	D
Typocerus a. acuticauda Casey, 1913	1*	1		1	Eastern-S	Unknown
Typocerus v. velutinus (Olivier, 1795)	1*	1	1	1	Eastern-S	D
Xestoleptura tibialis (LeConte, 1850)	1*	1+		1	Widespread-B	C
Lamiinae						
Lamiini						
Microgoes oculatus (LeConte, 1862)	1	1+		1+	Eastern-S	D
Monochamus carolinensis (Olivier, 1792)	1*	1*			Eastern-S	C
Monochamus marmorator Kirby, 1837	1	1		1	Eastern-S	C
Monochamus mutator LeConte, 1850	1*	1			Eastern-S	C
Monochamus notatus (Drury, 1773)	1*	1	1	1	Widespread	C
Monochamus s. scutellatus (Say, 1824)	1	1	1	1	Widespread	C
Pogonocherini						
Pogonocherus mixtus Haldeman, 1847	1*	1		1	Widespread	C, D
Pogonocherus penicillatus LeConte, 1850	1	1	1*	1	Widespread-B	C
Desmiphorini						
Psenocerus supernotatus (Say, 1823)	1	1		1	Widespread-S	D
Acanthoderini						
Aegomorphus modestus (Gyllenhal, 1817)	1*	1+		1	Eastern-S	D
Acanthocini						
Acanthocinus obsoletus (Olivier, 1795)	1				Eastern-S	C
Acanthocinus pusillus Kirby, 1837	1	1	1	1	Widespread-B	C
Astyleiopus variegatus (Haldeman, 1847)	1*	1		1	Widespread-S	D
Astylopsis collaris (Haldeman, 1847)	1*	1+			Eastern-S	D
Astylopsis macula (Say, 1827)	1	1		1	Eastern-S	D
Astylopsis sexguttata (Say, 1827)	1*	1+		1	Eastern-S	C
Graphisurus fasciatus (DeGreer, 1775)	1*	1+		1	Eastern-S	D
Hyperplatys aspersa (Say, 1824)	1	1	1	1	Widespread-S	D
Hyperplatys maculata Haldeman, 1847	1*	1		1	Widespread-S	D
Sternidius alpha (Say, 1827)	1*			1	Widespread-S	D
Sternidius misellus (LeConte, 1852)	1*	1+		1	Eastern-S	D
Saperdini						
Saperda calcarata Say, 1824	1*	1+	1	1	Widespread	D
Saperda candida Fabricius, 1787	1	1+		1	Widespread-E	D
Saperda fayi Bland, 1863	1	1+			Eastern-S	D
Saperda imitans Felt and Joutel, 1904	1*	1+			Eastern-S	D
Saperda inornata Say, 1824	1	1	1	1	Widespread-S	D
Saperda lateralis Fabricius, 1775	1*	1	1	1	Widespread-E	D
Saperda obliqua Say, 1826	1	1	1	1	Eastern-S	D
Saperda populnea moesta LeConte, 1850	1*	1+		1	Widespread-B	D
Saperda puncticollis Say, 1824	1				Eastern-S	Shrub
Saperda tridentata Olivier, 1795	1	1+		1	Eastern-S	D
Saperda vestita Olivier, 1824	1*	1+			Eastern-S	D
Phytoecini						
Oberea affinis Leng and Hamilton, 1896	1*	1+		1	Eastern-S	Shrub
Oberea deficiens Casey, 1924	1*			1	Eastern-S	Shrub
Oberea myops Haldeman, 1847		1+			Eastern-S	Shrub
Oberea pallida Casey, 1913	1*	1+		1	Eastern-S	D
Oberea praelonga Casey, 1913	1*	1+			Eastern-S	D
Oberea schaumii LeConte, 1852	1*	1			Widespread-S	D
Oberea tripunctata (Swederus, 1787)	1	1			Eastern-S	D
Tetraopini						
Tetrops praeusta (Linnaeus, 1758)	1*	1+			Palearctic-I	D

Table 3. The number of species of Cerambycidae recorded in the Atlantic Maritime Ecozone in each province. "Previously reported" includes those listed in McNamara (1991) or published since then, "New for province" are those species for which specimens were seen in collections during this work, and "No specimens seen" are those species that were not located in collections examined during this work and were listed in McNamara (1991).

	PQ	NB	PE	NS	AME
Previously reported	126	67	39	92	
New for province	0	47	4	5	
No specimens seen	57	2	1	2	
Total	126	116	44	99	133

Prioninae (2 tribes, 3 genera, 3 species)

Three species occur in the AME, with two distributed from southern Canada south through eastern North America, *Orthosoma brunneum* (Forster) and *Prionus laticollis* (Drury). These two feed on both hardwoods and conifers. The third, *Tragosoma depsarium* (Linnaeus), feeds on conifers and is widespread in North America and the Palearctic.

Spondylidinae (1 species)

One *Neospondylis upiformis* (Mannerheim) was collected by C.E. Atwood at Boiestown, New Brunswick, likely in the 1930s. This species is widespread in coniferous forests of western North America east to Newfoundland, however, records from east of Manitoba are sparse (Chemsak 1996; McCorquodale 2001; Smith and Hurley 2005).

Aseminae (1 tribe, 3 genera, 5 species)

The four native species have ranges that extend into the boreal forest, either only in the east, *Tetropium schwarzianum* Casey, or across the continent, *T. cinnamopterum*, *Arhopalus foveicollis* (Haldeman), or across coniferous forests of North America, Europe, and Asia, *Asemum striatum* (Linnaeus). *Tetropium fuscum* is a recent unintentional introduction from Europe (Smith and Hurley 2001). Concerns about the potential of this species to harm living spruce trees and its potential to transmit fungal pathogens to native spruce (Jacobs et al. 2003) resulted in an eradication program being initiated in the Halifax area in 2000 (Canadian Forestry Service 2003).

Cerambycinae (8 tribes, 22 genera, 34 species)

The 34 species found in the AME are distributed among five tribes, with most in the Clytini (13 species, 6 genera) and Callidiini (11 species, 7 genera). The ranges of more than half are primarily southern, from the AME and extending south to the southern United States. In the Cerambycinae of the AME, more species (20) use hardwoods as hosts than conifers (13). Most of the hardwood feeders have ranges restricted to eastern North America, and their ranges often extend to the southern United States (e.g., *Ropalopus sanguinicollis* (Horn), *Glycobius speciosus* (Say), *Megacyllene robiniae*). The conifer feeders tend to have broader ranges across North America (e.g., *Xylotrechus undulatus*) (see Table 4).

One species is introduced, the old house borer, *Hylotrupes bajulus* (Linnaeus). Despite being present in North America for more than 100 years and being relatively conspicuous because it occurs in buildings, there is only one report, from Sherbrooke, Quebec, from the AME (Laplante 1989). Two other species, *Callidium violaceum* (Linnaeus) and *Phymatodes testaceus* (Linnaeus), may be introduced (McNamara 1991) but are considered Holarctic here. Except for these two species, none are Holarctic, although many are replaced by similar congeners in the Palearctic (e.g., *Clytus* Laicharting, *Phymatodes* Mulsant, *Xylotrechus* Chevrolat). Other genera are represented by additional species in the southern United States and the Neotropics (e.g., *Psyrassa* Pascoe, *Megacyllene* Casey, *Neoclytus* Thomson).

Lepturinae (2 tribes, 34 genera, 49 species)

The vast majority of species, 48 of 49, are in the tribe Lepturini. The exception is *Desmocerus palliatus*, a species restricted to eastern North America and a specialist on *Sambucus* spp. In the Lepturini, 20 species use hardwoods as host, while 16 use conifers. Six species use both conifers and hardwoods as hosts, including two of the most common and widespread species, *Lepturobosca chrysocoma* and *Strangalepta abbreviata*. Five species for which hosts are unknown are in this tribe. They include the reasonably common and widespread *Idiopidonia pedalis* (LeConte), the much less frequently collected *Acmaeopsoides rufula* (Kirby), and *Leptura obliterata deleta*, only known in eastern Canada from New Brunswick. One species feeds on a variety of shrubs, *Grammoptera haematites* (Newman).

As in the Cerambycinae, the lepturine hardwood feeders tend to have the preponderance of their range south of the AME in the major deciduous forests of eastern North America. The conifer feeders tend to have broader ranges in the northern portions of the continent. Two conifer feeders, *Rhagium inquisitor* (Linnaeus) and *Gnathacmaeops pratensis* (Laicharting), are Holarctic, with ranges extending to the coniferous forests of northern Europe and Asia. Another species is Holarctic, with the North American subspecies *Pachyta lamed liturata* Kirby replaced by another subspecies in northern Europe and Asia. Many of the genera also occur in the Palearctic (e.g., *Leptura* Linnaeus, *Xestoleptura* Casey, and *Grammoptera* Audinet-Serville). Other genera have neotropical affinities (e.g., *Bellamira* LeConte).

Lamiinae (8 tribes, 14 genera, 40 species)

Many lamiines feed on living trees and have a relatively narrow host range. The seven species of *Oberea* Mulsant in the Phytoeciini are specialists, mostly on the stems and twigs of shrubs (e.g., *Oberea affinis* Leng and Hamilton on *Rubus* spp.). The seven species of *Saperda* Fabricius in the Saperdini all feed on hardwoods, some are specialists (e.g., *Saperda candida* Fabricius on service-berries, hawthorns, apple, and other

Table 4. Host use by subfamily and geographic distribution of Cerambycidae in the Atlantic Maritime Ecozone.

Geographic distribution	Deciduous	Coniferous	Deciduous and coniferous	Shrub	Unknown
Paradrinae, Prioninae, Spondylinae, and Aseminiinae					
Holarctic		2			
Palearctic-I		1			
Widespread		1			
Widespread-S					
Widespread-E			1		
Widespread-W		1			
Widespread-B		1			
Eastern		1			
Eastern-S			2		
Eastern-B					
Total	0	7	3	0	0
Cerambycinae					
Holarctic	1	1			
Palearctic-I		1			
Widespread	1				
Widespread-S	1				
Widespread-E					
Widespread-W		3			
Widespread-B		4			
Eastern					
Eastern-S	14	3			1
Eastern-B					
Total	17	12	0	0	1
Lepturinae					
Holarctic		2			
Palearctic-I					
Widespread		1	1		
Widespread-S					
Widespread-E	2				1
Widespread-W					1
Widespread-B	1	4	1		
Eastern		1			
Eastern-S	18	6	4	1	2
Eastern-B		2			1
Total	21	16	6	1	5
Lamiinae					
Holarctic					
Palearctic-I	1				
Widespread	1	2	1		
Widespread-S	7				
Widespread-E	2				
Widespread-W					
Widespread-B	1	2			
Eastern					
Eastern-S	14	5		4	
Eastern-B					
Total	26	9	1	4	0

woody Rosaceae, *S. tridentata* Olivier on elm), while others are generalists (e.g., *S. lateralis* Fabricius). The Lamiini includes the largest lamiines in the AME, the five species in the genus *Monochamus* Dejean, which all feed on conifers. The two species most frequently noticed by non-entomologists are *M. s. scutellatus* (Say) and *M. notatus* (Drury), both widespread in coniferous forests. The other species in the Lamiini, *Microgoes oculatus* (LeConte), feeds on a variety of hardwoods and was first found in southern Nova Scotia in 2003 (Dollin 2004) and in New Brunswick the next year.

As in the Cerambycinae and the Lepturinae, the lamiine hardwood feeders tend to have ranges extending south into the eastern and southern United States, and the conifer feeders have broader ranges across northern North America. An exception to this is the conifer feeder *Acanthocinus obsoletus* (Olivier), with a range primarily in the United States. Another exception is the poplar feeding *Saperda populnea moesta* LeConte, with a range extending north through the boreal forest where its host, *Populus balsamifera* L. (balsam poplar; Salicaceae), grows. Many of the genera are Holarctic (e.g., *Monochamus*, *Pogonocherus* Dejean, *Aegomorphus* Haldeman, *Oplosia* Mulsant, *Acanthocinus* Dejean, *Saperda*, *Oberea*). Other genera are restricted to eastern North America (e.g., *Microgoes* Casey, *Psenocerus* LeConte, *Astylopsis* Casey, *Graphisurus* Kirby) or have representatives in southern North America and south into the Neotropics (e.g., *Hyperplatys* Haldeman, *Sternidius* LeConte).

Origin and affinity of the fauna

The cerambycids of the AME have all colonized the region following the end of the last glaciation, which started about 20–21 ka (thousands of years ago; ages expressed as noncalibrated radiocarbon years) (King 1996). Quaternary deposits on Cape Breton Island and mainland Nova Scotia contain bark beetles (Scolytidae) in a warming period just more than 11.5 ka (Miller 1995, 1997). Since that time forest cover changed as the climate changed, initially coniferous trees typical of boreal forests, then an invasion by oaks and pines, indicating a warmer climate. Presumably, the fauna of Cerambycidae has changed in response to changes in forest cover, however, we have no direct evidence. There are no endemic cerambycids in the AME, so little can be said about the significance of nearby glacial refugia.

The current composition of the fauna of the AME is species of the hardwood forests of eastern North America and the coniferous forests of northern North America. Cerambycids of the AME are an extension of the fauna of the Mixedwood Plains Ecozone of southern Ontario and Quebec with the addition of a few boreal species. The cerambycids of the AME are mostly species that occur in the Mixedwood Plains Ecozone and have ranges extending east. More than 85% of the species in the AME also occur in the Mixedwood Plains Ecozone (see Table 2). There is also substantial overlap, about 25%, with boreal ecozones to the north and west.

The cerambycid fauna of Ontario and Quebec is more diverse than that of the AME. One reason is the rich fauna associated with southern hardwoods such as hickory and hackberry, which do not occur in the AME. Another reason is the broad latitudinal range of both provinces, resulting in both coniferous trees of the boreal forest and southern hardwoods in the same jurisdiction. Diversity of Cerambycidae follows diversity of trees.

There are only six species and one subspecies that do not occur in any other ecozone in Canada. Five are native that are rare in collections. *Acmaeops discoideus* (Haldeman) is associated with pines in the eastern United States. The specimen collected in suburban Halifax in 1959 is the only Canadian record of which I am aware. *Brachyleptura circumdata* Olivier and *Leptura obliterata deleta* (LeConte) have both been collected recently in southern New Brunswick by R. Webster. *Phymatodes ater* LeConte feeds on hardwoods in the eastern United States. Linsley (1964) states the range is from Nova Scotia to Pennsylvania, however, no specimens have been found in Canadian collections. *Oberea myops* Haldeman feeds on stems of rhododendron and other ericaceous shrubs. Several specimens were collected as part of a survey of insects in Kouchibouguac National Park, New Brunswick. The other two species are both introduced and have restricted ranges in both time and space. *Hylotrupes bajulus* was collected once in Sherbrooke, Quebec (Laplante 1989), while *Tetropium fuscum* has been found in the Halifax area since at least 1990 (Smith and Hurley 2001).

A portion of the hills of the Eastern Townships in southern Quebec are included in the AME. Several species of cerambycids occur in this small area, especially the portion west of Sherbrooke, and nowhere else in the AME. These include *Prionus laticollis*, *Grammoptera exigua* (Newman), *Metacmaeops vittata* (Swederus), *Acanthocinus obsoletus* (Olivier), and *Saperda puncticollis* (Say). Considering that New Brunswick and Nova Scotia have only four and three species not found in the other provinces, and Prince Edward Island none, six is significant. This area in Quebec is in the Great Lakes – St. Lawrence Forest Region, rather than the Acadian Forest Region, according to Rowe (1972). The presence of many cerambycids more typical of hardwood forests of southern Ontario indicates the connection with this forest region. Scudder (1979) indicated that Rowe's 12 sections of the Great Lakes – St. Lawrence Forest region were "not important to entomologists concerned with the patterns of insect distributions".

Anthropogenic effects, population trends, and endangered species

There are three primary ways that insect populations change in response to environments altered by humans: population decline or extirpation, expanded niches and populations, and establishment of non-native species (Turnbull 1979). Undoubtedly, populations and distributions of cerambycids have been altered within the AME with land clearing for European settlement in the 1700 and 1800s, abandonment of farmland

since the early 1900s, subsequent succession to spruce woods, and more recently, industrial forestry, with an emphasis on harvesting softwoods (Loo and Ives 2003; Bouman et al. (2005). For a group that feeds on trees, often on dead wood, populations, distributions, and abundances will have changed in an area with less than 5% of the original old forest extant (Mosseler et al. 2003). Since there are no baseline data on cerambycid populations, or even distributions, the extent of change is difficult to discern. Recent efforts have started to assess the impact of forest management practices on diversity of cerambycids (Kehler et al. 2004).

Increased interest in Cerambycidae in the AME stems from the recent recognition of *Tetropium fuscum*, an adventive species established in Halifax (Smith and Hurley 2001; Canadian Forestry Service 2003). Spread of this non-native species may have been arrested by an aggressive program of removal of suspect trees in Point Pleasant Park and elsewhere in the Halifax Regional Municipality. However, recent reports from Pictou and Cape Breton suggest it has not been contained.

Two other adventive species have restricted distributions. *Hylotrupes bajulus*, has only been recorded once at Sherbrooke, Quebec. *Tetrops praeusta* (Linnaeus) was recently found in Maine and in Quebec near Lake Champlain just west of the AME (Howden and Howden 2001; Landry 2001), and very recently in southern New Brunswick by R. Webster. This species feeds on a variety of hardwoods. A potential addition to the non-native fauna is *Callidiellum rufipenne* (Motchulsky). It feeds on the native conifers *Juniperus communis* L. and *Thuja occidentalis* L. (Cupressaceae) and presently has a restricted distribution centred on Connecticut (Maier and Lemmon 2000). As with other locations with significant transoceanic shipping, there is potential for more introductions (Humble and Allen 2001; Majka and Klimaszewksi 2004). Interceptions at ports show that beetles are transported around the world through commercial shipping (Humble and Allen 2001). For example, *Elaphidion mucronatum* (Say), a native of the east-central United States, was intercepted in February 1977 at the port of Halifax (NSMC).

It is difficult to assess whether there are species at risk or endangered species among AME cerambycids at this time. Assessment requires an understanding of the range within the AME, the broader geographic range, and population trends in the AME. Most collecting has been incidental and not focussed on a thorough inventory or population estimates. Therefore, ranges within AME are not well known nor are there historical data to assess trends.

The paucity of information on range and populations is reflected in the number of new records for the three Maritime Provinces. This review increases the number of species known for New Brunswick by 46 species or more than 50%. The recent compilation of records for Nova Scotia (McCorquodale and Bondrup-Nielsen 2004) added 38 species, compared to the 51 previously known for the province. Similarly, Majka et al. (2007) added 28 species to the 10 previously known in Prince Edward Island. Since those compilations were completed, four more species have been found in Nova Scotia and two in Prince Edward Island. *Microgoes oculatus* was collected in Queens County in 2003 during a study of wood boring beetles by Dollin (2004). *Grammoptera subargentata* (Kirby) was recognized in the collection of a naturalist, David Webster, from Kings County. *Acmaeops discoideus* was collected by Doug Ferguson in 1959 in a Halifax suburb. The specimen remained unidentified and not incorporated in the NSMNH collection of beetles until 2003. Finally, two specimens of *Semanotus litigiosus* (Casey) collected in northern Nova Scotia in the early 1990s and deposited in the collection of the Nova Scotia Department of Natural Resources were correctly identified by Serge Laplante of CNC.

A few species may be rare, that is, they have a restricted range and few collections: *Acmaeops discoideus*, *Acmaeopsoides rufula*, *Brachyleptura circumdata*, *Leptura obliterata deleta*, and *Oberea myops*. With the data available it is not possible to include species that may have experienced dramatic population declines in the past 50 years. Undoubtedly, more effort at documenting the fauna of the region and eastern Canada in general will change our understanding of how rare these species are and which species should be included on such a list.

Acknowledgements

The cooperation of the individuals in insect collections in eastern Canada was essential, and I thank Christopher Majka, Callum Ewing, and Andrew Hebda, NSMNH; Reginald Webster, Charters Settlement, New Brunswick; J.P. LeBlanc, NSAC; Rob Smith and Kenna MacKenzie, Agriculture and Agri-Food Canada, Kentville; Soren Bondrup-Nielsen, DeLancey Bishop, Acadia University; Randy Lauff, STFXU; Donna Giberson, UPEI; Mary Smith, Agriculture and Agri-Food Canada, Charlottetown; Donald McAlpine, NB Museum; Georgette Smith and Ken Harrison, CFS Fredericton; Terry Wheeler and Stephanie Boucher, Lyman Entomological Museum; Chris Darling, Brad Hubley, and Doug Currie, ROM; Bob Anderson, CMN; Yves Bousquet, Serge Laplante, Jeff Cumming, Henri Goulet, and Patrice Bouchard, CNC, for their assistance. Serge Laplante has provided a wealth of information about Cerambycidae, biology, and taxonomy over the past 5 years, and Christopher Majka has spurred me to study distributions of beetles in Atlantic Canada. Thanks to Chris Thomson, Clayton d'Orsay, Kathleen Aikens, Serge Laplante, Jon Sweeney, and Christopher Majka for helpful comments on earlier versions.

References

Bily, S., and Mehl, O. 1989. Longhorn Beetles (Coleoptera; Cerambycidae) of Fennoscandia and Denmark. Fauna Entomologica Scandinavica, **22**: 1–203.

Bouman, O.T., Vaninetti, N., Williams, M., and McCorquodale, D. 2005. Ecological and historical evidence of anthropogenic forest

transformations in eastern Cape Breton Island. Journal of Sustainable Forestry, **19(2004)**: 49–76.

Bousquet, Y. 2007. Nomenclatural and Bibliographic Notes on Cerambycidae (Coleoptera). Coleopterists Bulletin, **61**: 616–631.

Canadian Forestry Service. 2003. Discovery of *Tetropium fuscum* Brown Spruce Longhorn Beetle (BSLB) Chronology of Events [online]. Available from http://www.atl.cfs.nrcan.gc.ca/index-e/what-e/science-e/entomology-e/bslb-e/chronology-e.html [viewed February 2004].

Chemsak, J.A. 1996. Illustrated Revision of the Cerambycidae of North America. Volume I. Parandrinae, Spondylinae, Aseminae, Prioninae. Wolfsgarden Books, Burbank, CA. 150 pp.

Dollin, P. 2004. Effects of stand age and silvicultural treatment on beetle (Coleoptera) biodiversity in coniferous stands in southwest Nova Scotia. M.Sc. Thesis. Dalhousie University School of Resources and Environmental Studies, Halifax, NS. 90 pp.

Howden, H., and Howden, A. 2001. *Tetrops praeusta* (L.) (Coleoptera: Cerambycidae), a potential pest? Insecta Mundi, **14(2000)**: 220.

Humble, L.M., and Allen, E.A. 2001. Implications of non-indigenous insect introductions in forest ecosystems. *In* Proceedings: Integrated Management and Dynamics of Forest Defoliating Insects. *Edited by* A.M. Liebhold, M.L. McManus, I.S. Otvos, and S.L.C. Fosbroke. USDA, Forest Service, Northeastern Research Station, General Technical Report NE-277. pp. 45–55.

Jacobs, K., Seifert, K.A., Harrison, K.J., and Krisits, T. 2003. Identity and phylogenetic relationships of ophiostomatoid fungi associated with invasive and native *Tetropium* species (Coleoptera: Cerambycidae) in Atlantic Canada. Canadian Journal of Botany, **81**: 316–329.

Kehler, D., Bondrup-Nielsen, S., and Corkum, C. 2004. Beetle diversity associated with forest structure including deadwood in softwood and hardwood stands in Nova Scotia. Proceedings of the Nova Scotia Institute of Science, **42**: 227–239.

King, LH. 1996. Late Wisconsinan ice retreat from the Scotian Shelf. Geological Society of America Bulletin, **108**: 1056–1067.

Lafontaine, J.D., Allyson, S., Behan-Pelletier Lafontaine, J.D., Allyson, S., Behan-Pelletier, V., Borkent, A. Campbell, J.M., Hamilton, K.G.A., Martin, J.E.H., and Masner, L. 1987. The Insects, Spiders and Mites of Cape Breton Highlands National Park. Biosystematics Research Centre, Agriculture Canada, Ottawa, ON. 302 pp.

Landry, L.-P. 2001. *Tetrops praeusta* (Linné), une addition à la faune des Cerambycidae (Coleoptera) du Québec. Fabreries, **26**: 26–27.

Laplante, S. 1989. Contribution a l'inventaire des Cerambycidae (Coleoptera) de la province de Quebec. Fabreries, **14**: 56–83.

Linsley, E.G. 1961. The Cerambycidae of North America, part I. Introduction. University of California Publications in Entomology, **18**: 1–135.

Linsley, E.G. 1962*a*. The Cerambycidae of North America, part II. Taxonomy and classification of the Parandrinae, Prioninae, Spondylinae and Aseminae. University of California Publications in Entomology, **19**: 1–102.

Linsley, E.G. 1962*b*. The Cerambycidae of North America, part III. Taxonomy and classification of the subfamily Cerambycinae, tribes Opsimini through Megaderini. University of California Publications in Entomology, **20**: 1–188.

Linsley, E.G. 1963. The Cerambycidae of North America, part IV. Taxonomy and classification of the subfamily Cerambycinae, tribes Elaphidionini through Rhinotragini. University of California Publications in Entomology, **21**: 1–165.

Linsley, E.G. 1964. The Cerambycidae of North America, part V. Taxonomy and classification of the subfamily Cerambycinae, tribes Callichromatini through Ancylocerini. University of California Publications in Entomology, **22**: 1–197.

Linsley, E.G., and Chemsak, J.A. 1972. The Cerambycidae of North America, part VI, no. 1. Taxonomy and classification of the subfamily Lepturinae. University of California Publications in Entomology, **69**: 1–138.

Linsley, E.G., and Chemsak, J.A. 1976. The Cerambycidae of North America, part VI, no. 2. Taxonomy and classification of the subfamily Lepturinae. University of California Publications in Entomology, **80**: 1–186.

Linsley, E.G., and Chemsak, J.A. 1985. The Cerambycidae of North America, part VII, no. 1. Taxonomy and classification of the subfamily Lamiinae, tribes Parmenini through Acanthderini. University of California Publications in Entomology, **102(1984)**: 1–258.

Linsley, E.G., and Chemsak, J.A. 1995. The Cerambycidae of North America, part VII, no. 2. Taxonomy and classification of the subfamily Lamiinae, tribes Acanthocinini through Hemilophini. University of California Publications in Entomology, **114**: 1–292.

Linsley, E.G., and Chemsak, J.A. 1997. The Cerambycidae of North America, part VIII: bibliography, index and host plant index. University of California Publications in Entomology, **117**: 1–534.

Loo, J., and Ives, N. 2003. The Acadian Forest: historical condition and human impacts. Forestry Chronicle, **79**: 462–473.

Maier, C.T., and Lemmon, C.R. 2000. Discovery of the small Japanese cedar long-horned beetle, *Callidiellum rufipenne* (Motchulsky) (Coleoptera: Cerambycidae) in live arborvitae in Connecticut. Proceedings of the Entomological Society of Washington, **102**: 747–754.

Majka, C.G., and Klimaszewski, J. 2004. *Phloeocharis subtilissima* Mannerheim (Staphylinidae: Phloeocharinae) and *Cephennium gallicum* Ganglbauer (Scydmaenidae) new to North America: a case study in the introduction of exotic Coleoptera to the port of Halifax, with new records of other species. Zootaxa, **78**: 1–15.

Majka, C.G., McCorquodale, D.B., and Smith, M.E. 2007. The Cerambycidae (Coleoptera) of Prince Edward Island: new records and further lessons in biodiversity. The Canadian Entomologist, **139**: 258–268.

Marske, K.A., and Ivie, M.A. 2003. Beetle fauna of the United States and Canada. Coleopterists Bulletin, **57**: 495–503.

McCorquodale, D.B. 2001. New records and notes on previously reported species of Cerambycidae (Coleoptera) for Ontario and Canada. Proceedings of the Entomological Society of Ontario, **132**: 3–13.

McCorquodale, D.B., and Bondrup-Nielsen, S. 2004. Do we know beetles? Lessons from new records of Cerambycidae (Coleoptera) for Nova Scotia. Proceedings of the Nova Scotia Institute of Science, **42**: 209–223.

McNamara, J. 1991. Family Cerambycidae longhorned beetles. *In* Checklist of Beetles of Canada and Alaska. *Edited by* Y. Bousquet. Research Branch, Agriculture Canada, Publication 1861/E, Ottawa, ON. pp. 277–300.

Miller, R.F. 1995. Late glacial Coleoptera and the paleoclimate at Hirtles, Nova Scotia. Atlantic Geology, **31**: 95–101.

Miller, R.F. 1997. Late-glacial (Allerod – Younger Dryas) Coleoptera from central Cape Breton Island, Nova Scotia, Canada. Canadian Journal of Earth Science, **34**: 247–259.

Miroshnikov, A.I. 1998. [Reclassification of longicorn beetles of the *Anoplodera* complex, tribe Lepturini (Coleoptera, Cerambycidae) of the Holarctic fauna: I.] Entomologicheskoe Obozrenie, **77**: 384–421. [In Russian; English translation *in* Entomological Review, **78**: 437–465.]

Monne, M.A., and Giesbert, E.F. 1995. Checklist of the Cerambycidae and Disteniidae (Coleoptera) of the Western Hemisphere. Wolfsgarden Books, Burbank, CA. 419 pp.

Mosseler, A., Lynds, J.A., and Major, J.E. 2003. Old-growth forests of the Acadian Forest Region. Environmental Reviews, **11**: S47–S77.

Robertson, S. 1990. Point Pleasant Park Halifax, Nova Scotia Bark Beetle Survey. Halifax Field Naturalists, Halifax, NS. 40 pp.

Rowe, J.S. 1972. Forest Regions of Canada. Canadian Forest Service Publication 1300. 172 pp.

Sama, G. 2005. Description of *Neospondylis* gen. nov. from North America and Mexico (Coleoptera, Cerambycidae, Spondylinae). Les Cahiers Magellanes, **43**: 1–10.

Santos-Silva, A. 2002. Notas e descrições em Parandrini (Coleoptera, Cerambycidae, Parandrinae). Ihleringia, Série Zoologia, **92**: 30–52.

Scudder, G.G.E. 1979. Present patterns in the fauna and flora of Canada. Memoirs of the Entomological Society of Canada, **108**: 87–179.

Smith, G., and Hurley, J.E. 2001. First North American record of the Palearctic species *Tetropium fuscum* (Fabricius) (Coleoptera: Cerambycidae). Coleopterists Bulletin, **54(2000)**: 540.

Smith, G.A., and Hurley, J.E. 2005. First records in Atlantic Canada of *Spondylis upiformis* Mannerheim and *Xylotrechus sagitattus sagittatus* (Germar) (Coleoptera: Cerambycidae). The Coleopterists Bulletin, **59**: 488.

Solomon, J.D. 1995. Guide to insect borers in North American broadleaf trees and shrubs. USDA Forest Service Agriculture Handbook 706. 735 pp.

Turnbow, R.H., and Thomas, M.C. 2002. Family 120. Cerambycidae Leach 1815. *In* American Beetles, Volume 2, Polyphaga: Scarbaeoidea Through Curculionoidea. *Edited by* R.H. Arnett, M.C. Thomas, P.E. Skelley, and J.H. Frank. CRC Press, Boca Raton, FL. pp. 568–601.

Turnbull, A.L. 1979. Recent changes to the insect fauna of Canada. Memoirs of the Entomological Society of Canada, **108**: 180–194.

Webster, R.P., McCorquodale, D.B., and Majka, C.G. 2009. New records of Cerambycidae (Coleoptera) for New Brunswick, Nova Scotia and Prince Edward Island, Canada. ZooKeys, **22**: 285–308.

Yanega, D. 1996. Field Guide to Northeastern Longhorned Beetles (Coleoptera: Cerambycidae). Illinois Natural History Survey Manual 6, Champaign, IL. 174 pp.